AFOSR

FY 96 Technology Transitions/Transfers

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ABOUT THIS DOCUMENT

This document lists 451 transitions from basic research to applications in the US Air Force, in US industry, and in other defense or nondefense government organizations. Only transitions reported during FY96 are listed; transitions reported in prior years are not repeated in this report.

All reported transitions are the result of basic research funded by AFOSR; this research in many cases is still ongoing. In most cases, the research was initiated years ago, and in a few cases decades ago.

This document reports current transitions as contrasted to the customary historical reporting as to how research laid the foundations for current technology and products. We used the following to define "current transitions":

A technology transition or transfer is a partnership between basic researchers and users where both expend nontrivial and sufficient resources toward realizing a product, process, or analytical objective.

Every entry must meet the requirement that both the supplier and the customer be named and the "item" be described as both a research achievement and a customer benefit. The columns of the pages featuring the detailed entries represent the following:

Subarea	numerical designator of the lowest level budgetary breakdown of AFOSR's programs
Title	name of the subarea
PM	name of responsible AFOSR program manager
Performer . . .	name and organization of the AFOSR funded researcher
Customer . . .	name and organization of the customer
Result	description of the research result(s)
Application .	description of the use and/or application objective

The summary table of the 451 transitions/transfers on page iii provides data grouped in three categories:

a. The category labeled "Performers" summarizes the entries by the performers of research, i.e., by the sectors to which those we sponsor belong. For example, the last entry on Page 1 lists as a performer "Garscadden and Nagpal, WL/POOD" and, thus, counts as a transition from an Air Force laboratory, whereas the last entry on Page 2, performer George Caryotakis, Stanford University, counts as a transition from a university grantee. Note that 31 percent of AFOSR's sponsorship funds goes to intramural research in Air Force laboratories, 64 percent goes to university researchers, and the balance goes to researchers working in industry or other government laboratories.

b. The category labeled "Customers" summarizes the transitions to a user. AFOSR's major customer sectors are the downstream exploratory and advanced development (6.2 and 6.3A) programs in the Air Force laboratories, industrial customers, and customers in other Air Force or governmental organizations. For example, on Page 2, the fifth entry lists a 6.2 customer ("Ms Sandra Fries-Carr, WL/POOC"), the sixth entry is a customer in another governmental organization, the

Naval Research Lab (“Dr R.K. Parker”), and on Page 3, the first entry is an industrial customer (“March Instruments, Inc.”).

Often, the industrial customer is sponsored by 6.2 or 6.3A funds from Air Force laboratories, DARPA, or another Service, or works under contract with DOD acquisition organizations.

c. The category labeled “Application” captures the three principal application objectives: products, processes, and other technology benefits (e.g. data codes, software, etc.). Examples are as follows: the fourth entry on Page 10 is a process application (“provides an alternative production method for producing bulk metallic glass materials”), the second entry on Page 14 is a product application (“development of high performance polyimide materials for composite structures in aerospace aircraft”), and the fourth entry on the same page belongs in the “other benefits” category (“vehicle design for the X-33 program”).

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1996 BASIC RESEARCH TRANSITIONS

*Sums of categories exceed fiscal year total due to more than one customer per transition.

Subarea	Title	PM	Performer	Customer	Result	Application
2301A	Photonic Physics	Schlossberg	Stephen Brueck, University of New Mexico (505) 277-6033	MRS Technology, Gary Ropiak, (508) 250-0450	Interference Optical Lithography for Field Emission Displays	Ultrafine lithography for future generation inexpensive field emission projection and helmet mounted displays using optical methods.
2301A	Photonic Physics	Schlossberg	Richard Osgood, Columbia University, (212) 854-4462	RSoft, Inc., LuAnn Scarmozzino, (914) 734-2665	Faster, more user friendly, more capable, and more accurate modeling of complex opto-electronic integrated circuits	Design and analysis capability for complex optoelectronic integrated circuits.
2301A	Photonic Physics	Schlossberg	Harold Fetterman UCLA (310) 825-3431	TRW, John Brock, (310) 812-0087	Optical control of HEMTs for millimeter wave generation	Means for generating, controlling, and delivering millimeter wave signals for use in phased array radars, especially remote and multi-antenna.
2301C	Optics	Schlossberg	Jack Feinberg, USC (213) 740-1134	Spectra Diode Laboratories, David Welsh, (408) 943-9411	Locking of semiconductor lasers using mutual nonlinear phase conjugation	High power, high beam quality, compact semiconductor lasers for directed energy and IR countermeasures application.
2301C	Optics	Schlossberg	Martin Fejer, Stanford University, (415) 725-7509	David Deacon Deacon Research Corp. (415) 493-6100	Periodically poled ferroelectric materials	Compact lasers shifted to wavelengths necessary for application in optical and IR countermeasures.
2301C	Optics	Schlossberg	Aaron Lewis, Hebrew University (972) 263-5243	MFEL Program, Michael Marron, (703) 696-4038	Near-field scanning optical microscopy	Infrared materials analysis with subwavelength spatial resolution for electronic, structural, and biological understanding and inspection.
2301D	Atomic & Molecular Physics	Kelley	Will Happer, Princeton University, (609) 258-4382	Magnetic Imaging Technologies, Inc., (MITI), Bastiaam Driehuys, (919) 572-0954	Laser-polarized gases for in-vivo magnetic resonance imaging (patent number 5,545,396)	Patent licensed to MITI to produce polarized gas production devices for magnetic resonance imaging applications.
2301D	Atomic & Molecular Physics	Kelley	Terry A. Miller, OSU, Biswa N. Gangula and Peter Bletzinger, WL/POOD, (513) 255-2923	Dr Jay Jeffries, (415) 859-6341, Phillips Laboratory, OL-AC PL/RFE, Dr Ron Spores SRI International	Absolute H atom density measurement by two-photon laser induced fluorescence	Measurement of molecular hydrogen dissociation as function of input power in an arc jet thruster permits validation of thruster models for energy conversion efficiency.
2301D	Atomic & Molecular Physics	Kelley	Dr Alan Garscadden and Dr Rajesh Nagpal, WL/POOD, (513) 255-2246	Queens University, Belfast, N. Ireland, Dr Bill Graham, 232-245-133	H Formation through H2 Rydberg States	Simpler and more efficient plasma chamber design using amplitude modulated rf power sources.
2301D	Atomic & Molecular Physics	Kelley	Biswa N. Ganguly and Peter Bletzinger, WL/POOD, (513) 255-2923	Johns Hopkins University, Applied Physics Laboratory, Dr David VanWie, (301) 953-5194	High pressure large volume non-equilibrium plasma generation	A transformation coupled inductively excited plasma source has been developed and is being used in tests of hypersonic drag modification.

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2301D	Atomic & Molecular Physics	Kelley	Dr Rajesh Nagpal and Dr Garscadden, WL/POOD, (513) 255-2246; J. Clark, Washington State University	SEMATECH, Dr Gregory Hebner, (505) 844-6831	Electron transport data for BCl3 and SiF4	Dollars to WL/POOD from SEMATECH for data on microelectronic etchants and plasma reactor design applicable to the production of military electronics.
2301D	Atomic & Molecular Physics	Kelley	R. Wu, (937) 255-2923, K-Systems	Ms Sandra Fries-Carr, (937) 255-6016, NASA Lewis; Dr Schweickart, (937) 255-9189, WL/POOC (6.2)	Low friction, large area diamond-like carbon (DLC) coatings, and High resistivity DLC films	Tribology for aeronautical and space gearbox applications, and high-temperature capacitors can be used in jet engine electronics and diagnostics.
2301D	Atomic & Molecular Physics	Kelley	D. Schweickart, WL/POOX Dr Alan Garscadden and Dr Rajesh Nagpal, WL/POOD, (513) 255-2246	WL/POO (more electric initiative), LANTIRN SPO (low-altitude navigation and targeting infrared for night), Dr Dan Schweickart, (937) 255-9189	Signal processing for statistics of insulation degradation	270 v connector studies, G. Rhoads, J. Horwath, L. Walko, and for determining qualification standards for high voltage wiring for airborne and aerospace applications.
2301D	Atomic & Molecular Physics	Kelley	Capt Pat Emmert, (937) 255-2923, WL/POOD	Ms Sandra Fries-Carr, (937) 255-6016, WL/POOC (6.2)	High quality diamond films	High temperature capacitors can be used in jet engine electronics and diagnostics.
2301E	Plasma Physics	Barker	Hezhong Guo, (301) 405-5018, University of Maryland	Naval Research Laboratory, Dr R.K. Parker, (202) 767-6655	Demonstrated the feasibility of ganging higher harmonic gyrotrons to achieve highly efficient AMPLIFIER mode operation	Future zero-weight, switchable field communications system for satellite links.
2301E	Plasma Physics	Barker	George Caryotakis, Stanford University, (415) 926-4446	Phillips Lab/WSR, Dr Moe Arman, (505) 846-9652	Perfected unique capability to design and fabricate ultraclean, high vacuum HPM components	PL will directly apply these computational capabilities to their ongoing multimillion dollar 6.2 & 6.3 efforts in the high power microwave source area.
2301E	Plasma Physics	Barker	Reece Roth, University of Tennessee at Knoxville (615) 974-4446	March Instruments Inc., Mr John Vaspucci, (916) 433-6954	Demonstrated the use of an efficient glow discharge to generate volumes of plasma in the open atmosphere	Will be applied to aircraft systems under testing to determine feasibility as a method for controlling drag on a wing surface.
2305B	Electronic Devices	Witt	R. Webster, M. Anwar, RL/ERAC, (617) 377-4038	Lockheed Martin/Sanders, Nashua, NH, Dr John Heaton, (603) 885-1054	The Rome Lab team solved Schrodinger and Poisson equations self-consistently for HEMT structures, affording materials and geometry guidance to device designers in optimizing design	To be used in the design of various AF and DOD circuit applications, particularly those requiring low-noise, high-frequency operation.
2305B	Electronic Devices	Witt	Chris Bozada, WL/AADD, (937) 255-6871, ext 3458	Northrup/Grumman ESSD, Dr B. Bayraktaroglu (410) 987-7646	The Wright Lab team designed and fabricated a thermal-shunt HBT. Produced record levels of power output with best-reported reliability	For use in applications to wireless communications and radar systems.

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2305B	Electronic Devices	Witt	Chris Bozada, WL/AADD, (937) 255-6871, ext 3459	UES, Inc., Dr R. Bhattacharya, (937) 252-4092	The Wright Lab team designed and fabricated a thermal-shunt HBT. Produced record levels of power output with best-reported reliability	For use in applications to wireless communications and radar systems.
2305B	Electronic Devices	Witt	Chris Bozada, WL/AADD, (937) 255-6871, ext 3460	Epitronics, Dr M. Tishler, (602) 581-3663	The Wright Lab team designed and fabricated a thermal-shunt HBT. Produced record levels of power output with best-reported reliability	For use in applications to wireless communications and radar systems.
2305B	Electronic Devices	Witt	Chris Bozada, WL/AADD, (937) 255-6871, ext 3461	Spire Corp., S. Vernon, (617) 275-6000	The Wright Lab team perfected the design and fabrication for an advanced Carbon doped HBT. This device offers advantages for high power/high efficiency applications	For use in applications to wireless communications and radar systems.
2305B	Electronic Devices	Witt	Prof. M. Melloch, Purdue University, (317) 494-3528	MellWood Laboratories, Dr E. Harmon, (317) 426-3662	Prof Melloch developed the materials and device capability to produce an ultrafast photodetector operating over the 400-900 nm range	The MellWood Laboratory publicly released a commercial photodetector using this technology in June 1996.
2305B	Electronic Devices	Witt	Dr R. A. Murphy, MIT Lincoln Laboratories, (617) 981-7841	Hughes Research Laboratory, Malibu, CA, Dr D. Docter, (310) 317-5736	Dr Murphy perfected a buffer layer using LT GaAs that, when used with PHEMTs, gives improved power performance and reduced backgating	Hughes will use this technology in V-band MMICs for application in space and communication systems.
2305C	Electronic Components & Circuits	Witt	Prof. Chenming Hu, University of California at Berkeley, (510) 642-3393	SEMATECH Cadence Mentor Graphics Metasoft pSpice (plus 125 others), (512) 445-3463	A new mobility model has been incorporated into the Berkeley MOSFET IC simulator model. It has been adopted by SEMATECH as the industry standard model and has been widely adopted	The Berkeley BSIM3v3 model is now in routine use as the MOSFET portion of various circuit simulation tools. As such, it finds daily application in all manner of silicon circuit design.
2305C	Electronic Components & Circuits	Witt	Prof. R. Battacharya, University of Michigan at Ann Arbor, MI (313) 763-6678	Hughes Research Laboratories, Malibu, CA, Dr E. Croke, (310) 317-5321	The Michigan team has developed a new buffer layer for use in lattice-mismatched SiGe/Si structures that results in defect-free materials	Hughes will use the approach in the production of high frequency HBT circuits.
2305C	Electronic Components & Circuits	Witt	Prof P. Battacharya, University of Michigan at Ann Arbor, MI (313) 763-6678	NASA Cleveland, Cleveland, OH, Drs S. Alterovitz and G. Ponchak, (216) 433-3517	The Michigan team has developed a new buffer layer for use in lattice-mismatched SiGe/Si structures that results in defect-free materials	NASA will employ the Michigan technology in the realization of high frequency HBT-based MMICs.
2305D	Optoelectronic Information Processing	Craig	Dr Thomas Mossberg, Physics Department, University of Oregon, Eugene, OR, (541) 346-4779	Templex Corporation, Larry Brice, Eugene, OR, (503) 382-0976	Time sequence access techniques for spectroscopic optical memory	High areal density optical memory (10 Gbit/sq in) with ultra-high bandwidth I/O (5 Gbit/sec/channel). Pertinent to AF capture and processing of terabytes per day of surveillance photography, reported by Rome Lab.

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2305D	Optoelectronic Information Processing	Craig	Dr John Walkup, Electrical Engineering Department, Texas Tech. University, Lubbock, TX, (806) 742-3500	Dr Ravinder Kachru, Molecular Physics Laboratory PS077, SRI International, Menlo Park, CA 94025 (415) 859-3727	Analysis of optimal error correction codes for spectroscopic optical memory	High bandwidth, highly parallel interface to spectroscopic optical memory. Application in depositing as well as locating and retrieving pertinent imagery data for visualization or battle management from fused imagery data.
2305D	Optoelectronic Information Processing	Craig	Dr Rufus Cone, Physics Department, Montana State University, Bozemen, MT 59717 (503) 382-0976	Dr Ralph Hutcheson, Scientific Materials Corp., 310 Icepond Road, PO Box 786, Bozeman, MT (406) 585-3772	Spectroscopic characterization of thulium doped yttrium aluminum garnet	Best material discovered to date for use in persistent spectral hole burning optical memory. Supports optical DRAM for image buffering and processing at high bandwidth and in field-parallel formats.
2305D	Optoelectronic Information Processing	Craig	Dr Fouad E. Kiamilev, Department of Electrical Engineering, University of North Carolina at Charlotte, Charlotte NC 28223 (704) 547-3345	Dr Matthew Derstine, Optivision, 3450 Hillview Ave., Palo Alto, CA 94304, (415) 855-1776	Designed hybrid CMOS-SEED optoelectronic interface chips	Supports parallel interconnect hardware demonstration for optical memory interface. Manages parallel I/O at high bandwidth (~Gigaframe per second) for image database processing applications.
2305D	Optoelectronic Information Processing	Craig	Dr Fouad E. Kiamilev, Department of Electrical Engineering, University of North Carolina at Charlotte, Charlotte NC 28223 (704) 547-3345	Dr Ashok Krishnamoorthy, Room 4B-523, AT&T Bell Labs, 101 Crawford Corner Road, Holmdel, NJ 07733 (908) 949-1847	Designed hybrid CMOS-SEED optoelectronic interface chips	Optoelectronic interfaces for parallel crossbar switching in telephone exchange switches and for access to buffer memory. Provides parallel to serial I/O capability for image database communication.
2305E	Semiconductor Materials	Prairie	Prof Stephen Forrest, Dept of Electrical Engineering, Princeton University, Princeton, NJ, (609)258-4532	Dr Raymond Fok, (310) 333-5186, Dr Jean-Michel Guerin, (310) 333-5191, Mark Geslicki, (310) 333-7013, Xerox Corporation, El Segundo, CA	Developed multicolor, transparent, organic light-emitting device (TOLED) using organic molecular-beam deposition in vacuum	Multicolor head-up displays, visor-mounted displays for pilots, virtual-reality headsets for remotely-piloted vehicles; flat-panel instrument and computer displays.
2305F	Electromagnetic Materials	Prairie	Prof John Ekerdt, Dept of Chemical Engineering, the University of Texas, Austin, TX (512)471-4689	Jon J. Candelaria, (512) 933-6300 Motorola Corp.	Demonstrated enhanced performance in p-type SiGe MOSFETs (transistors) by engineering the strain and energy properties by adding carbon to the SiGe alloy	High-bandwidth signal processing for real-time battlefield awareness and target discrimination; cellular communication.
2305F	Electromagnetic Materials	Prairie	Dr David Bliss, Rome Lab, RL/ERX, Hanscom AFB, MA (617) 377-4841	GT Equipment Technologies, Inc., Nashua, NH, Kedar Gupta, (603) 883-5200,	Magnetically-stabilized, liquid-encapsulated Czochralski growth of InP	Optical fiber based, light-weight, on-board sensors and data networks for aircraft and satellites; high-performance microwave/RF transmitters for communication links and countermeasures.
2305G	Quantum Electronic Solids	Weinstock	Dr M.R. Beasley, Stanford University (415) 723-1196	3M, Joseph Storer, (612) 733-6462	Tunable diode laser used in manufacturing process development	HTS tapes for magnets and cables for use in generators and energy storage systems.

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2305G	Quantum Electronic Solids	Weinstock	Drs James H. Rose and John Moulder, Iowa State University (515) 294-7537 and 9750	Sierra Matrix, Inc., John Carruthers, (510) 623-3690	Software and hardware module for eddy-current measurements of aircraft	Used in the detection and characterization of corrosion in aircraft lap splices.
2305G	Quantum Electronic Solids	Weinstock	Dr David Awschalom, University of California at Santa Barbara (805) 893-2121	Digital Instruments, Inc., Ken Babcock, (805) 967-1400, ext. 277	Submicron current imaging technique using magnetic force microscopy	Inspection and characterization of buried conductors in integrated electronics used in communications and information processing.
2305G	Quantum Electronic Solids	Weinstock	Dr David Awschalom, University of California at Santa Barbara (805) 893-2121	Digital Instruments, Inc., Lucien Ghislein, (805) 967-1400, ext. 288	Bent 100-nm near-field optical-fiber cantilevers for existing AFM instruments	Room-temperature scanning near-field optical imaging of integrated laser structures for optoelectronic signal processing.
2305G	Quantum Electronic Solids	Weinstock	Dr John Talvacchio Northrop Grumman STC (412) 256-1437	US Government and Northrop Grumman Electronic Sensors & Systems Division, H. Ball, (410) 765-0410	Six-mask-level integrated circuit process for first multilayer HTS digital circuits based on single-flux-quantum (SFQ) logic	20 Ghz-bandwidth digital receivers for more secure communications.
2305G	Quantum Electronic Solids	Weinstock	Dr John Talvacchio Northrop Grumman STC (412) 256-1437	DARPA, F. Patten, and Northrop Grumman Electronic Sensors & Systems Division, G. Bates, (410) 765-2535	Improved HTS films applied to filters switchable between low insertion loss and 50 dB isolation	More secure and lower power requirements for electronic warfare.
2302B	Mechanics of Materials	Jones	Dr Maciej Kumosa University of Denver, Denver, CO (303) 871-3807	Dr Michael Castelli NASA Lewis Res Ctr Cleveland, OH	Experimental results and mathematical models of micro-level and macro-level failure mechanisms for graphite-reinforced composite materials based on polyimide resins	NASA is exploring the use of advanced high-temperature polymer-matrix composites for turbine engine applications, including cowling structures, to increase the thrust-to-weight ratio of the engines.
2302B	Mechanics of Materials	Jones	Dr Kenneth Reifsnider, Virginia Polytechnic Institute, Blacksburg, VA (703) 231-5316	Mr Tom Gates NASA Langley Research Center, Hampton, VA	Mechanism-based mechanics models which capture the temperature-driven property changes and long-term environmental degradation of polymer-based composite materials	High-temperature polymer-matrix composites are to be used in the design of the NASA High-Speed Civil Transport (HSCT) for major sections of the airframe to decrease weight and improve performance of this future aircraft.
2302B	Mechanics of Materials	Jones	Dr Asher Rubenstein Tulane University New Orleans, LA (504) 865-5771	Dr Phillip Adler Northrup-Grumman Co., Bethpage, NY	Analysis methodology for internal damage in ceramic-matrix composite materials which accounts for matrix cracking and fiber/matrix interface debonding	Northrup-Grumman Corporation is considering using advanced ceramic-matrix composites in high-temperature applications in their low-cost ceramic composites program if the failure mechanisms of these materials can be understood.
2302B	Mechanics of Materials	Jones	Dr Autar Kaw, University of South Florida Tampa, FL (813) 974-5626	Dr Allan Katz WL/MLL WPAFB, OH, (513) 255-9824	Mathematical models of damage growth in ceramic-matrix composites which account for matrix cracking as the crack approaches a fiber and produces fiber/matrix interface debonding	Wright Laboratory is developing ceramic-matrix composites for advanced aerospace engine applications, and the modeling of the initiation and growth of internal damage is critical to safe operation in service.

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2302B	Mechanics of Materials	Jones	Dr A. F. Grandt Purdue University (317) 494-5117	Mr James Rudd WL/FIB WPAFB, OH	Analysis methods for multiple-site damage can account for numerous small fatigue cracks around fastener holes in aircraft structures and the associated reduction in strength	Large-scale tests are being conducted to determine the reduction in residual strength caused by multiple-site damage in aircraft structural members, and the analysis methods are necessary to interpret test results.
2302B	Mechanics of Materials	Jones	Dr Robert Wei, Lehigh University Bethlehem, PA (610) 758-3585	Mr James Rudd WL/FIB, WPAFB, OH	Mechanistic models of corrosion and fatigue which consider the interaction of chemical and mechanical degradation in order to produce realistic life models for aircraft structures	These mechanistic models are being incorporated into actual life prediction computer codes, such as MODGRO, which are used to certify flight safety for a wide range of Air Force aircraft.
2302C	Particulate Mechanics	Chipley	Jack Dvorkin, Stanford University, (415) 725-9296	Jeff Rish, WL/FIVC Tyndall AFB, FL, (904) 283-3705	First principle contact laws	An improved airfield pavement design and life cycle analysis accounting for long-term creep of asphalt binders.
2302C	Particulate Mechanics	Chipley	C. S. Chang, University of Massachusetts, (413) 545-5401	Jeff Rish, WL/FIVC Tyndall AFB, FL, (904) 283-3706	Upper/Lower bound limits	An improved airfield pavement design and life cycle analysis accounting for long-term creep of asphalt binders.
2302C	Particulate Mechanics	Chipley	Gary Olhoeft, Colorado School of Mines, (303) 273-3458	Tom Stauffer, AL/EQC, Tyndall AFB, FL (904) 283-6059	Multi-channel data acquisition system for Complex Resistivity Measurement	A low-cost method for site characterization of Air Force installation contaminated soils and groundwater for long-term monitoring.
2302C	Particulate Mechanics	Chipley	Ben Sternburg, University of Arizona, (602) 621-2439	Tom Stauffer, AL/EQC, Tyndall AFB, FL (904) 283-6060	Multi-band ground penetrating radar	A low-cost method for site characterization of Air Force installation contaminated soils and groundwater for long-term monitoring.
2302C	Particulate Mechanics	Chipley	Roman Hryciw, University of Michigan, (313) 763-5491	Tom Stauffer, AL/EQC, Tyndall AFB, FL (904) 283-6061	Borehole Imaging System	A low-cost method for site characterization of Air Force installation contaminated soils and groundwater for long-term monitoring.
2302C	Particulate Mechanics	Chipley	Tony Saada, Case Western Reserve University, (216) 368-2427	Jeff Rish, WL/FIVC Tyndall AFB, FL, (904) 283-3706	Shear band measurement in granular soils	A new method of geomaterial characterization to determine earth penetrators parameters.
2302D	Structural Mechanics	Sanders	Ali Nayfeh, Virginia Tech, (540) 231-5453	Cessna Aircraft Company, John Axtell, (316) 941-6000	Computer code coupling nonlinear unsteady aerodynamics, structural dynamics, and control systems	Predict on set of flutter, post-flutter behavior, and active flutter control.
2302D	Structural Mechanics	Sanders	Ali Nayfeh, Virginia Tech, (540) 231-5454	Wolfram Research, Cetin Cetinkaya, (217) 398-0700	Mathematical based software to solve (approx.) an arbitrary set of non-linear differential equations	Structural dynamics, power systems, ships, submarines, and aircraft.
2302D	Structural Mechanics	Sanders	Michael Howe, Boston University, (617) 353-5869	Navy, NSWC, Bill Blake, (301) 227-1879	Methodologies for predicting vibration damping of perforated elastic plates	Sound and vibration problems of ships and submarines.
2302D	Structural Mechanics	Sanders	Earl Dowell, Duke University, (919) 660-5389	Wright Laboratory, Mark Hopkins, (513) 255-7384; Pratt and Whitney, Gary Hilbert, (860) 565-5422	Reduced Order Modeling Methodologies for Aerodynamic Models	Aeroelastic analysis of highly flexible aircraft structures.

Subarea	Title	PM	Performer	Customer	Result	Application
2302D	Structural Mechanics	Sanders	Tinsley Oden, Computational Mechanics Company, Inc., (512) 467-0618	NASA, Veloria Martinson (512) 467-0618; Goodyear, Dr Michael Trinko, (330) 796-1722	Friction Model has been incorporated into TIRE3D/TCAN	Analysis of nonlinear deformations of tires.
2302D	Structural Mechanics	Sanders	John Junkins, Texas A&M, (409) 845-3947	E-Systems	Multiresolution and wavelet techniques	Crack growth and corrosion detection in NDE of USAF RC135.
2302D	Structural Mechanics	Sanders	John Junkins, Texas A&M, (409) 845-3948	Lockheed Martin, Denver	Dynamic and control methodology for fine pointing of flexible structures	Large spacecraft and structures.
2306A	Metallic Structural Materials	Ward	J. Beuth, Carnegie Mellon University, (412) 268-3873	Ohmer Erdmann, GE Aircraft Engines, (513) 243-9908	Experimental and analytical results show that low ductility materials can eliminate elastic stress concentrators	Blade root design for low pressure turbine blades made of TiAl.
2306A	Metallic Structural Materials	Ward	S. L. Semiatin, WL/MLLN, (513) 255-1345	J.T. Morgan, F-22 SPO, (513) 255-1711, x2397	Model of fracture during hot working of TiAl used to develop criteria for strain-induced porosity in alpha-beta titanium alloys	Large plan-view airframe forgings such as bulkheads for F-22.
2306A	Metallic Structural Materials	Ward	Linda Rishel, Carnegie Mellon University, (412) 268-2973	W. Johnson, (818) 395-4411, Amorphous Technologies International	First use of Induction Skull Melting (ISM) technique to produce amorphous alloys	Provides an alternative production method for producing bulk metallic glass materials.
2306A	Metallic Structural Materials	Ward	R.E. Dutton, WL/MLLN, (513) 255-9396	R. Weaver, Coors Ceramic Company, (303) 277-4116	Knowledge of material behavior during powder consolidation applied to "slumping" during sintering of aluminum titanate and transformation-toughened zirconia	Used for automotive engine and exhaust components.
2306A	Metallic Structural Materials	Ward	T. Pollock, Carnegie Mellon University, (412) 268-2973	C. Austin, GE Aircraft Engines, (513) 243-2114	Effects of microstructural variability on mechanical properties of TiAl castings	Enhanced processing modifications for casting TiAl low pressure turbine blades.
2306A	Metallic Structural Materials	Ward	P. Steif, Carnegie Mellon University, (412) 268-3507	C. Austin, GE Aircraft Engines, (513) 243-2114	Determination of effects of indentor geometry on material response	Better experimental characterization technique for simulating Foreign Object Damage (FOD) on turbine blade materials.
2306A	Metallic Structural Materials	Ward	K. Muraleedhran, Carnegie Mellon University, (412) 268-3507	S. Ram, Precision Cast Parts, (503) 777-3881; C. Austin, GE Aircraft Engines, (513) 243-2114; P. Martin, Rockwell International Science Center, (805) 373-4274	Established World Wide Web site for dissemination of TiAl-relevant research results. First included was metallographic preparation techniques	Provides standard TiAl metallographic preparation technique for use by researchers across the nation.

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2306B	Ceramic & Non-metallic Structural Materials	Pechenik	Helen Chan, Lehigh University, (610) 758-5554	TDA Research, Inc., Jack Sibold, (303) 422-7819	Small additions of Yttrium and Lanthanum greatly increase creep resistance of alumina ceramic materials	Very high temperature oxide fibers for composites for engine-related applications.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	W. P. Hoffman, PL/RKFE, DSN 275-5768	Virginia Tech., FDA, Scott Keller, (540) 231-8697	Carbon microtubes of accurately-controlled dimensions can be used to measure microbial intrusion in food packaging	Standard for food and medical packaging testing.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	W. P. Hoffman, PL/RKFE, DSN 275-5768	Thiokol, John Shigley, (801) 863-2381	Process for in-situ densification of carbon and ceramic composites, that reduces processing time 100-fold	Rocket propulsion and hypersonic components, and aircraft brakes.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	W. Kriven, University of Illinois (217) 333-5258	McDonnell Douglas, Dr James French, (314) 777-5243	Super-strength amorphous oxide fibers	Composites for structural applications of aircraft.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	W. Kriven, University of Illinois (217) 333-5258	Pratt & Whitney, Rowena Ecklund, (407) 796-2000, Oak Ridge Lab., Matt Ferber, (423) 576-0818, German Aircraft Research (DLR), Harthmut Schneider, 49-2203-6012430	Amorphous oxide fibers process and development. Yttrium phosphate laminates and coatings	Targets for nuclear fusion.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	Jack Lackey, GTRC (404) 894-0573	Ceramic Composites, Inc., Larry Fehrenbacher, (301) 261-8373, Knolls Atomic Power Laboratory, Lynne Kolaya, (518) 395-5209, Bettis Atomic Power Laboratory, Wayne Ohlinger, (412) 476-6549	A new approach to fabricating ceramic matrix and carbon matrix composites. The approach is based on producing laminated matrix with very high toughness and environmental stability. The new process for fabricating laminated matrix composites	Radiators, heat exchangers, a number of classified applications, and thrust chambers for engines.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	John Brennan, UTRC, (860) 610-7220	Pratt and Whitney/GESP, Robert Warburton, (407) 796-2347 and Bob Miller (407) 796-5972	Technology for fabricating ceramic-matrix composites based on BN-coated SiC fibers (Nicalon) in glass-ceramic matrix (BMAS)	NASA HSCT/EPM gas turbine engine acoustic nozzle liner based on Helmholz resonator principle.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	Ken Sandhage, Ohio State University, (614) 292-6731	Edward Orton Ceramic Foundation, J. Richen Schorr and Wei-wah Chen, (614) 895-2663	The Solid Metal-Bearing Precursor method for fabricating BaTiO4 thermistors	Temperature sensing via PTCR, and for measuring temperature at a point.

Subarea	Title	PM	Performer	Customer	Result	Application
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	Ken Sandhage, Ohio State University, (614) 292-6731	Target Materials, Inc., Columbus, OH, J.R. Gains, (614) 486-0261	A method for fabricating cylindrical ceramic sputtering targets utilizing the zero-shrinkage features of the SMP process	Sputtering targets for numerous military and industrial applications.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	Ken Sandhage, Ohio State University, (614) 292-6731	Bobcock and Wilcox, Richard Gettler, (804) 522-6418	A processing technique utilizing Mg infiltration in porous alumina ceramics with subsequent oxidation of metal to produce spinel ceramics	Ceramic engine components, both monolithic and fiber-reinforced.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	John Brennan, UTRC, (860) 610-7220	Pratt and Whitney/GESP, Robert Warburton (407) 796-2347, and Bob Miller, (407) 796-5972	Technology for fabricating ceramic-matrix composites based on BN-coated SiC fibers (Nicalon) in glass-ceramic matrix (BMAS)	NASA HSCT/EPM gas turbine engine acoustic nozzle liner based on Helmholz resonator principle.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	W. Sproul, BIRL, (847) 491-4108	Greenfield Industries, T. Muehlhans, (706) 650-4102	Nano-layered Nitride and Oxide Coatings show excellent properties in wear and cutting applications	Improving properties of high-speed cutting drills for manufacturing parts from metals, ceramics and polymers.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	W. Sproul, BIRL, (847) 491-4108	Kenametal Co., Dennis Quito, (412) 539-4851	Nano-layered oxide coatings. Novel materials, their properties, and the process of manufacturing	Coatings for tools for dry-machining of very hard materials.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	Wang Ming-Show, BIRL, (847) 491-2746	Ford Motors, Bill Wessel, (313) 323-8984	New laminated carbon nitride/TiN and Carbon nitride ZrN coatings show extreme stability in cutting conditions; the process for production of these coatings	Cutting tools and drilling inserts for processing parts made of metals and polymers.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	Wang Ming-Show, BIRL, (847) 491-2746	Timken Co., Harvy Nixon, (330) 471-2046	Ultra-hard carbon nitride coatings and the process to produce them	Major improvements in life of steel bearings.
2306B	Ceramic & Non-metallic Structural Materials	Pechenik	Sankar Sumbasevan, BIRL, (847) 491-4619	Bobcock and Wilcox, Dr Rich Goettler, (804) 522-6418	New sol-gel approach to coating fibers and surfaces with lanthanum phosphate	Land-based turbine engines, heat exchangers, hot gas filters.
2306C	Organic Matrix Composites	Lee	Dr Chuk Leung, Poly Comp., (619) 535-9474	John Glatz, Sparta Inc., (619) 350-1830	PMR-15 Types Polyimides	Development of materials for missile and projectile nose cones.
2306C	Organic Matrix Composites	Lee	Dr Chuk Leung, Poly Comp., (619) 535-9475	J. M. Jacobs, Rohr Inc., (909) 351-5400	PMR-15 Types Polyimides	Development of materials for aircraft engine nacelles and structures.
2306C	Organic Matrix Composites	Lee	Dr Chuk Leung, Poly Comp., (619) 535-9476	J. McCormack, GE Engines, (513) 243-4417	PMR-15 Types Polyimides	Development of materials for aircraft engine nacelles and structures.
2306C	Organic Matrix Composites	Lee	Dr Roger Morgan, Michigan State University, (517) 839-8502	Dr John Russell, WL/MLBC, (513) 255-1471	Microcrack formation and growth characterization in BMI-C fiber composites	Life prediction of composite structures in aircraft.
2306C	Organic Matrix Composites	Lee	Dr Roger Morgan, Michigan State University, (517) 839-8503	Dr Dick Cornelia, DuPont, (619) 350-1830	Moisture saturated polyimide carbon fiber composites damage mechanism	Development of high performance polyimide materials for composite structures in aerospace aircraft.

Subarea	Title	PM	Performer	Customer	Result	Application
2306C	Organic Matrix Composites	Lee	Dr Roger Morgan, Michigan State University, (517) 839-8504	Dr Anna Yen, Northrop, (310) 942-5392	Moisture saturated polyimide carbon fiber composites damage mechanism	Materials development for aerospace aircraft.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Steve Schneider, Purdue University, (317) 494-3343	Harris Hamilton, NASA LaRC	Boundary layer transition data	Vehicle design for the X-33 program.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Steve Schneider, Purdue University, (317) 494-3344	Dr S. Tagaki, Japanese National Aerospace Laboratory, Japan	Quiet tunnel transition data	Transition location on high-speed civil transport configuration.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6692	Maj Rich Patterson, Air Force Seek Eagle Program Office (AFSEO)	Wall functions applied to F-22 solution	Weapons release design for the F-22.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6693	Maj Rich Patterson, Air Force Seek Eagle Program Office (AFSEO)	Aero loads on Mk-82 LDGP	Weapons release design for the F-22.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6694	Mr Clark Mickelson, US Army Missile Command (MICOM)	Wall functions for missile plume	AIM-7 missile plume prediction for use on aircraft.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6695	Mr Clark Mickelson, US Army Missile Command (MICOM)	Dynamic motion in computational fluid dynamic simulation	Tumbling fuel tank trajectory ballistic accuracy application.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6696	Maj Rich Patterson, Air Force Seek Eagle Program Office (AFSEO)	Dynamic motion in computational fluid dynamic simulation	Mk-82 release from B-2 bay under full weapons load.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6697	Vernon Eachus, Lockheed-Martin	Dynamic motion in computational fluid dynamic simulation	THAAD missile staging.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6698	Pete Amstutz, F-22 SPO	Dynamic motion in computational fluid dynamic simulation	Maneuvering F-22 performance; and combined roll-pitch-yaw.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6699	Steve Worth, Lockheed Skunkworks	Wall functions on X-33 SSTO	Jet effects on X-33 single stage to orbit (SSTO) vehicle.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6700	Barry Acker, OC-ALC	B-1B flare trajectory analysis	Analyses of B-1B flare strike accidents.

Subarea	Title	PM	Performer	Customer	Result	Application
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6701	Capt Steve Herzig, ASD/YME, Eglin AFB	Wall functions for AIM-120	Calculation of AIM-120 pylon loads on aircraft.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6702	Alex Krynytzky, NASA/NWTC	Wall functions for national wind tunnel	Assessments of national wind tunnel complex design.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6703	Jim Engle, F-22 SPO	16T and 16S contraction flow quality	Analyses of tunnels 16T and 16S flow stability.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Fred Shope et. al., Sverdrup, AEDC, (615) 454-6704	Jim Engle, F-22 SPO	High alpha F-22 tests	Calculation of F-22 high angle of attack characteristics.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Doyle Knight, Rutgers University, (908) 445-4464	Marty Haas, UTRC	High-speed inlet simulations	Analyses of NAVY cruise missiles design for Project "Cheapshot".
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Brian Smith, LMTAS, (817) 935-1127	F-22 SPO	Internal weapons bay large eddy simulation (LES) code	Simulations of F-22 transonic weapons release.
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Rainald Lohner, (703) 993-4075	Norm Malmuth, Rockwell Science Center	Dynamic motion in computational fluid dynamic code	B-1B weapons release
2307A	External Aerodynamics & Hypersonics	Sakell	Dr Scott McRae, North Carolina State, (919) 515-5244	Carl Trexler, NASA Langley	Dual-mode scramjet flowfields	Earth-to-orbit vehicles design
2307A	External Aerodynamics & Hypersonics	Sakell	Iain Boyd, CALTECH (607) 255-4563	Dr K. Zhu, Rockwell Inc.	Low-density hypersonics	Satellites and low-earth orbit vehicles
2307A	External Aerodynamics & Hypersonics	Sakell	Iain Boyd, CALTECH (607) 255-4564	Dr I. Min, Aerospace Corp.	Parallel Direct Simulation Monte Carlo (DSMC) Code	Low-density plumes for satellites
2307A	External Aerodynamics & Hypersonics	Sakell	Iain Boyd, CALTECH (607) 255-4565	Dr F. Lumpkin, NASA Johnson Center	Parallel Direct Simulation Monte Carlo (DSMC) Code	Low-density plumes for satellites
2307A	External Aerodynamics & Hypersonics	Sakell	Iain Boyd, CALTECH (607) 255-4566	Dr A. Droeger, NASA Marshall	Parallel Direct Simulation Monte Carlo (DSMC) Code	Low-density plumes for satellites
2307A	External Aerodynamics & Hypersonics	Sakell	Iain Boyd, CALTECH (607) 255-4567	Dr M. Marconi, AER Inc, Cambridge MA	Parallel Direct Simulation Monte Carlo (DSMC) Code	To evaluate flow over probes traveling through planetary atmospheres
2307B	Turbulence & Internal Flows	McMichael	Drs D.E. Parekh and A.B. Cain, McDonald Douglas Aerospace (MDA), (314) 233-4324 and (314) 233-2526	Wright Labs and MDA, Dr Steve Walker, (937) 255-6207	Design and scaling guidelines for WL nozzle integration study	Plume mixing enhancement (Fluidic Injection Nozzle Technology) and an MDA full-scale demonstration of active mixing technology

Subarea	Title	PM	Performer	Customer	Result	Application
2307B	Turbulence & Internal Flows	McMichael	Dr D.E. Parekh, MDA, Dr C.B. Rogers, Tufts University, Dr A. Glezer, Georgia Tech., (314) 233-4324 and (404) 894-3266	MDA, Dr Val Kibens, (314) 233-3811	Characterization of two-phase flow inside nozzle and in jet plume	New high aspect ration nozzle designs currently being developed by McDonnell Douglas Corporation Flashjet Program.
2307B	Turbulence & Internal Flows	McMichael	Drs Ari Glezer and Mark G. Allen, Georgia Tech., (404) 894-3266 and (404) 894-9419	MDA and NASA, Langley, Dr Richard Wlezien, (757) 864-5532	Synthetic jet actuators and other novel actuator concepts for use in mixing enhancement, thrust vectoring and aerodynamic shape modification	Flight test program on the YC-15 which is being refurbished as a technology development testbed for the C-17.
2307B	Turbulence & Internal Flows	McMichael	Dr C.M. Ho, UCLA, Caltech, (310) 825-9993	Dr Tom Austin, (310) 982-9555, MDA, NASA, Dryden, Dr Paul Smith, Naval Surface Warfare Center	Development and Implementation of MEMS shear stress sensors	Instrumentation of McDonnell Douglas industrial wind tunnel for use in McDonnell Douglas aircraft development, NASA/Dryden flight test of micro sensors, sensors for underwater test.
2308A	Space Power & Propulsion	Birkan	B.T. Zinn, Georgia Tech. (404) 894-3033	David Amos, Westinghouse Electric Corp., (407) 281-3263	Magnetostrictive actuator fuel injection system	To stabilize low Nitride Oxides NOX FT8 gas turbine for power generation.
2308A	Space Power & Propulsion	Birkan	B.T. Zinn, Georgia Tech. (404) 894-3033	Pratt and Whitney, UTRC C.N. Nett (203) 727-7957	Observer for real-time determination of the characteristics of the instability	Will be applied to unstable jet engines and compressor systems to eliminate stall and noise.
2308A	Space Power & Propulsion	Birkan	E.Y. Choueiri and R.G. Jahn, Princeton University (609) 258-5220	Science Research Labs, Inc., J. Jacobs (617) 547-1122	Laser-Interferometer-based Microthrust stand	Impulse Measurements of new Pulsed Plasma Thruster developed by SRL, Inc. for future microsatellites.
2308A	Space Power & Propulsion	Birkan	E.Y. Choueiri and R.G. Jahn, Princeton University (609) 258-5220	General Research Corporation, G. Dhalen (805) 964-7724	Laser-Interferometer-based Microthrust stand	Impulse Measurements of deflagration plasma thruster developed by GRC for future microsatellites.
2308A	Space Power & Propulsion	Birkan	M.A. Cappelli Stanford University (415)725-2020	Loral IRIS, J. Mroczkowski (617) 863-3064	GaN and AIN synthesis using arecjet thrusters	Fabrication of UV radiation sensors and detectors.
2308A	Space Power & Propulsion	Birkan	M. Martinez-Sanchez MIT Laboratories, (617) 253-5613	C.S. Draper Laboratory, M. Socha (617) 258-2126	Design and construction of 50W Hall Thruster following basic scaling from 1.3 kW existing engine	Drag cancellation for future microspacecraft from Draper Laboratories.
2308A	Space Power & Propulsion	Birkan	T.B. Brill, University of Delaware, (302) 831-6079	SECA, Inc., R.C. Farmer (205) 534-2008	Kinetics and Species of Pyrolysis of HTPB	Modeling of 250K lb. experimental thrust hybrid rocket for launch systems and missiles.

Subarea	Title	PM	Performer	Customer	Result	Application
2308A	Space Power & Propulsion	Birkan	I.D. Boyd, Cornell University, (607) 255-4563	I. A. Min, Aerospace Corporation, (310) 336-2868	Parallel Direct Simulation Monte Carlo (DSMC) Code	Spacecraft contamination
2308A	Space Power & Propulsion	Birkan	I.D. Boyd, Cornell University, (607) 255-4563	K. Zhu, Rockwell Corporation, (818) 586-0577	Parallel Direct Simulation Monte Carlo (DSMC) Code	Spacecraft contamination
2308A	Space Power & Propulsion	Birkan	A. Fontijn, Rensselaer Polytechnic Institute, (518) 276-6508	H. S. Pergament, Propulsion Science & Technology Inc., (609) 924-1070	Dominance of CO2 continuum emission from 200-270 nm	Missile warning systems on aircraft and helicopters.
2308A	Space Power & Propulsion	Birkan	C.K. Law, Princeton University (609) 258-5271	NGB Technologies, Inc., G. Tryggvason (313) 763-1049	Dynamics of droplet collisions	Code validation and verification studies for droplet collisions.
2308A	Space Power & Propulsion	Birkan	R. Burton, University of Illinois, (217) 244-6223	Col. P. Rustan, USAF, (703) 506-5057, NRL M. Osborn, (202) 767-9168	High efficiency microthruster	Small satellites
2308B	Airbreathing Combustion	Tishkoff	Dr C. K. Law, Princeton University, (609) 258-5271	Mr John Petri, Universal Oil Products, Des Plaines IL, (847) 391-3156	Experimental determination of laminar flame speeds and flammability limits of combustible mixtures	Assessment of flashback and explosion hazards of chemical reactors - refinery safety measure for the production of aviation fuels and lubricants.
2308B	Airbreathing Combustion	Tishkoff	Dr S. M. Correa, General Electric Corporate Research and Development, (518) 387-5853	Mr David Burrus, General Electric Aircraft Engines, Evendale OH, (513) 243-2611	Physical/chemical combustion submodels	Incorporation into the CONCERT three-dimensional gas turbine design computer code for advanced aeropropulsion systems, such as IHPTET Phase III and beyond.
2308B	Airbreathing Combustion	Tishkoff	Dr Daniel E. Rosner, Yale University, (203) 432-4391	Dr M. B. Dowell, Advanced Ceramics Corp., (216) 529-3900	Correlation for chemical vapor deposition	Design of SiC yarn fiber coating processes for aerospace composite materials in lightweight airframes for future aircraft and aerospace vehicles.
2308B	Airbreathing Combustion	Tishkoff	Dr S. B. Pope, Cornell University, (607) 255-4314	Dr M. S. Anand, Allison Engine Company, Indianapolis IN, (317) 230-2828	Velocity-frequency-composition PDF code	Design calculation methodology for future gas turbine engines, such as IHPTET Phase III and beyond.
2308B	Airbreathing Combustion	Tishkoff	Dr Tim Edwards, WL/POSF, (513) 255-3524	Dr Terry Ronald, WL/MLLM, WPAFB, OH, (937) 255-1237	Data for coking, fuel/superalloy compatibility at 1400 F	HyTech scramjet materials evaluation for hydrocarbon-fueled aeropropulsion at Mach 6 and above.
2308B	Airbreathing Combustion	Tishkoff	Dr Tim Edwards, WL/POSF, (513) 255-3524	Mr B. Bossi, NAWC/WPNS, China Lake CA, (619) 927-2896	JP-10 fuel thermal stability information, test stand fuel system design	Scramjet injector testing for HyTech and other programs.

Subarea	Title	PM	Performer	Customer	Result	Application
2308B	Airbreathing Combustion	Tishkoff	Dr Tim Edwards, WL/POSF, (513) 255-3524	Mr Lyle Parker, Betz Process Chemical, Woodlands TX, (281) 367-2442	Quartz crystal microbalance for fuel thermal stability tests	JP-8 fuel thermal stability additive development.
2308B	Airbreathing Combustion	Tishkoff	Dr Tim Edwards, WL/POSF, (513) 255-3524	Mr Tedd Biddle, Pratt and Whitney Engines, West Palm Beach FL, (561) 796-1201	Quartz crystal microbalance for fuel thermal stability tests	JP-8 fuel thermal stability additive development.
2308B	Airbreathing Combustion	Tishkoff	Dr W. M. Roquemore, WL/POSC, (513) 255-6813	Dr H. C. Mongia, General Electric Aircraft Engines, Evendale OH, (513) 243-2552	Direct numerical simulation for diffusion flames	IHPTET Phase III combustor design.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. K. Hanson, Stanford University, (415) 723-1745	Dr Mark Allen, Physical Sciences, Inc., Andover MA, (508) 689-0003	Method for measuring air mass flux by spectrally resolved absorption of oxygen using a tunable diode laser	Mass flux measurement in a ground test of an F-100 engine.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. K. Hanson, Stanford University, (415) 723-1745	Dr Peter DeBarber, MetroLaser, Irvine CA, (714) 553-0688	Planar laser-induced fluorescence (PLIF) imaging of high temperature nonreacting flow using acetone tracer	Extension of the FlameMap PLIF Imaging System -- advanced laser diagnostic for aircraft and space launch combustor research and development.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. K. Hanson, Stanford University, (415) 723-1745	Dr Mike Holden, Calspan Corporation, Buffalo NY, (716) 631-6853	Diode laser-based sensor for water vapor	Measurement of test time in hypersonic shock tunnel testing facility.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. K. Hanson, Stanford University, (415) 723-1745	Dr Lawrence Cohen, GenCorp/Aerojet, Sacramento CA, (916) 355-5182	PLIF imaging of hydroxyl radicals in combustion gases	PLIF measurements in ground testing of the Titan IV Stage 1 engine.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. K. Hanson, Stanford University, (415) 723-1745	Mr Mark Newfield, NASA Ames Research Center, Moffet Field CA, (650) 604-4893	Diode laser methods to probe high temperature gases using spectrally resolved absorption	First application of diode laser sensing in high-enthalpy arcjet spacecraft thruster test facilities.
2308C	Propulsion Diagnostics	Tishkoff	Dr H. G. Hornung, California Institute of Technology, (818) 395-4551	Mr M. Brown, MetroLaser, Irvine CA, (714) 553-0003	Laser-Induced Thermal Acoustics (LITA) measurement technique	NASA-funded hypersonics tests.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. B. Miles, Princeton University, (609) 258-5131	Dr R. Seasholtz, NASA Lewis Research Center, Cleveland OH	Iodine absorption model	Pressure, temperature, and velocity optical imaging in propulsion systems.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. B. Miles, Princeton University, (609) 258-5131	Dr Michael W. Smith, NASA Langley Research Center, Hampton VA	Iodine absorption model	Pressure, temperature, and velocity imaging for scramjet propulsion testing.

Subarea	Title	PM	Performer	Customer	Result	Application
2308C	Propulsion Diagnostics	Tishkoff	Dr R. B. Miles, Princeton University, (609) 258-5131	Dr Michael S. Smith, MicroCraft Technology, AEDC, Arnold AFB TN	Iodine absorption model	Supersonic wind tunnel testing.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. B. Miles, Princeton University, (609) 258-5131	Dr John Lowrance, Princeton Scientific Instruments, Inc., Monmouth Junction NJ	Pulse burst laser	MHz-rate imaging system for general aerospace aerodynamics and propulsion research and development.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. B. Miles, Princeton University, (609) 258-5131	Dr Leigh Bromley, Positive Light, Inc., Los Gatos CA	Pulse burst laser	Commercial laser system for high-speed imaging relevant to aerodynamics and propulsion system research and development.
2308C	Propulsion Diagnostics	Tishkoff	Dr R. B. Miles, Princeton University, (609) 258-5131	Mr Glen Rines, Schwartz Electro-Optics, Inc., Concord MA	Mercury vapor filter/narrow band Ti:sapphire laser	Commercial laser/measurement diagnostic technique for research and development of combustors and hypersonic aerodynamic systems.
2303B	Surface Science	DeLong	Steve Sibener, University of Chicago (773) 702-7193	Mark Greenbaum, Topometrix Corp., (708)-717-0566	Electronics for high-impedance STM imaging (developed to satisfy a basic research need)	Circuitry needed for commercial Scanning Tunneling Microscope (STM) to image molecular overlayers.
2303B	Surface Science	DeLong	Steve Sibener, University of Chicago (773) 702-7194	Bruce Zabransky, Argonne National Laboratory, (630) 252-4046	Ultra-High vacuum technology for atomic traps	Generation of ultra-low temperature atomic beams for atomic/synchrotron physics and small-scale pattern deposition.
2303B	Surface Science	DeLong	Steve Sibener, University of Chicago (773) 702-7195	Hiroshi Kajiyama, 81492966006, and Hrvoje Petek, Advanced Research Laboratory, Hitachi Ltd., Japan	Multiple supersonic molecular beam methods of materials growth	Improved growth of advanced semiconductors for electronic devices.
2303B	Surface Science	DeLong	Steve Sibener, University of Chicago (773) 702-7196	Wilson Li, Intel Corp., (408) 765-2837	Electron enhanced oxidation of materials	Improved oxidation and patterning of semiconductors for electronic device applications.
2303B	Surface Science	DeLong	Kent Eisentraut, WL/MLBT, (513) 255-4860	Tom Jackson, WL/POSL, (513) 255-5568	PFPAE liquid lubricant	Provided candidate IHPTET Phase II lubricants for evaluation.
2303B	Surface Science	DeLong	Kent Eisentraut, WL/MLBT, (513) 255-4860	Steve Didzulis, Aerospace Corp., (310) 336-0460	Liquid lubricant technology	Used for spacecraft lubrication applications.
2303B	Surface Science	DeLong	Jeffrey Zabinski, WL/MLBT, (513) 255-8544	Steve Didzulis, Aerospace Corp., (310) 336-0460	Functionally gradient and multilayered diamond like carbon coatings	Used for doubling lifetime of satellite systems employing momentum control devices.
2303B	Surface Science	DeLong	Jeffrey Zabinski, WL/MLBT, (513) 255-8544	Andy Both, Holman Plating and Manufacturing Co., (513) 228-2191 ext. 250	Plasma emission based process for vacuum-arc deposition of multicomponent transition metal nitrides	Metal nitride coated components using this technology are flying in Air Force systems.

Subarea	Title	PM	Performer	Customer	Result	Application
2303B	Surface Science	DeLong	Larry Hench, University of Florida (904) 462-5445	Jean Luc Nogues, Geltech Inc., (904) 462 2358	PMMA impregnated porous gel-silica matrices	Commercial pilot plant testing under license.
2303B	Surface Science	DeLong	S. Ray Taylor, University of Virginia (804) 982-5788	Jim Dante, Wright Lab, (513) 254-0137 and Teresa Simpson, Bethlehem Steel Homer Research Lab, (601) 694-5374, and Ed Colvin, Alcoa Technical Center (412) 337-2550	Capillary electrophoresis	Adopted approach to occluded site chemistry to understand corrosion in lap splice joints, etc.
2303B	Surface Science	DeLong	David Kanis, Chicago State University, (312) 995-2339	Ben Thorson and Andrew Hibbs, Quantum Magnetics, (619) 481-7410	Monolayer assembly methodology	Improving adhesion of packaging materials to high temperature superconductor devices.
2303B	Surface Science	DeLong	Steve Pearton, University of Florida, (352) 846-1086	Mark Jensen, Honeywell, (612) 954 2625	Process for dry etching of magnetic materials (NiFe alloys)	High density magnetic recording head arrays used for read-write applications in hard disk drives.
2303B	Surface Science	DeLong	Steve Pearton, University of Florida, (352) 846-1086	Fan Ren, Lucent Technologies, (908) 582-6902	Room temperature dry etching technique for Cu	Magnetic devices and Copper (Cu) interconnects in silicon VLSI for chips that have 10,000 or more interconnects.
2303B	Surface Science	DeLong	Steve Pearton, University of Florida, (352) 846-1086	Randy Shul, Sandia National Labs, (505) 844-6126	Improved dry etch chemistries for GaN alloys	High temperature electronics/blue light emitters used for applications that endure extreme temperatures.
2303B	Surface Science	DeLong	Steve Pearton, University of Florida, (352) 846-1086	T.W. Haas, WL/MLBM, WPAFB OH, (513) 255-5892	Patterned GaAs substrates for quantum wire regrowth	Low power electronics/high density memory used in magnetic media.
2303B	Surface Science	DeLong	Steve Pearton, University of Florida, (352) 846-1086	S.-S. Sun, Planar America, (503) 690-1100	Etch recipe for high efficiency blue phosphors	Electroluminescent flat panel display arrays used for monitor displays.
2303B	Surface Science	DeLong	F. Sharifi, University of Florida, (352) 846-1086	R.C. Dynes, UCSD, (619) 534-2919	Process for lithography on high Tc superconductors	SQUID magnetometers, for possible use in non-destructive evaluation techniques.
2303B	Surface Science	DeLong	F. Sharifi, University of Florida, (352) 846-1086	M. Paalannen, 35841601, Helsinki University of Technology	Process for nanofabrication of Al tunnel junctions	Coulomb blockage devices for SET transistors for use in circuit boards.
2303B	Surface Science	DeLong	Max Lagally, University of Wisconsin, (608) 263-2078	Oliver Murphy, Lynntech, (409) 693-0017	AFM tip coating technology	To be used for examining corrosion for Air Force aircraft.

Subarea	Title	PM	Performer	Customer	Result	Application
2303B	Surface Science	DeLong	Nelson Forster, WL/POSL, (513) 255-4347	Larry Beckworth, Teledyne Ryan Aeronautical, (419) 470-3378 and David Lanman, WL/POT, (513) 255-2767	Vapor lubrication, bearing material, and cage design and material	Vapor lubrication is scheduled for demonstration in Joint Expendable Turbine Engine Concept, Phase II engine.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Ashley Sabin, Hoechst Celanese, (908) 522-7631	POSS monomer technology	Advanced structural plastics used in heat dissipation for rocket nozzles and flame retardants.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Robert Marshman, Aldrich Chemical Co., (414) 273-3850, ext. 5377	POSS monomer technology	A new chemical to be added to the R&D catalog of chemicals.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Ed Ellis, Polymer Technologies, (508) 694-1278	POSS monomer technology	Hard contact lenses for humans.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Kushroo Gandhi, Pilkington Barnes Hind, (408) 991-6362	POSS monomer technology	Soft contact lenses for humans.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Lt Rich Vaia, WL/MLBP, DSN 785-9184	POSS monomer technology	Nonlinear Optics (NLO) matrices used for aircraft canopies.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Jeff Gilman, FAA/NIST, (301) 975-6573	POSS polymer technology	Fire safe plastics for aircraft
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Dave Valia, Pilkington Aerospace Inc., (714) 893-7531, ext. 462	POSS monomer technology	Nonlinear Optics (NLO) matrices used for aircraft canopies.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Ed Guthrie, Hewlett Packard Co., (302) 633-8641	POSS polymer technology	High temperature support material used for chromatographic columns.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Robert Miller, IBM, (408) 927-1646	POSS monomer technology	Lithographic and electronic packaging for chip technology
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Barry Arkles, Gelest, (215) 547-2484	POSS monomer technology	A new chemical to be added to the R&D catalog of chemicals.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Gary Wieber, Dow Corning, (517) 496-5622	POSS polymer technology	Advanced silicon based composites used in structural materials.
2303B	Surface Science	DeLong	Joseph Lichtenhan, OLAC PL/RKS, (805) 275-5749	Lloyd Huff, UDRI, (513) 229-3515	POSS monomer and polymer additive technology	CRDA to supply industry with the materials for many applications

Subarea	Title	PM	Performer	Customer	Result	Application
2303C	Polymer Chemistry	Lee	Dr Frank Bates, University of Minnesota, (612) 625-6606	Dr Mark Gehlsen, 3M Corp., (612) 736-5635	Poly(ethyleneoxide)-poly(alkane) block copolymers	Utilization of the amphiphilic characteristics of the blends in bulk and surface applications.
2303C	Polymer Chemistry	Lee	Dr Frank Bates, University of Minnesota, (612) 625-6607	Dr Gunilla Gilberg, Kimberly Clark, (770) 587-7384	Aliquot of poly(ethylethylene)-poly(dimethysuil oxane) diblock coploymer	Polypropylene surface modifier for material properties tailoring in commercial applications.
2303C	Polymer Chemistry	Lee	Dr Ray Chen, University of Texas at Austin, (512) 471-7035	Dr Guy Hammer, BMDO, (703) 693-1620	WD(D)M Devices	High bandwidth audio-video transmission for communications in C4I applications.
2303C	Polymer Chemistry	Lee	Dr Ray Chen, University of Texas at Austin, (512) 471-7035	Dr R. Leheny, DARPA, (703) 696-2279	WD(D)M Devices	High performance bit-parallel computer links for advanced optoelectronics.
2303C	Polymer Chemistry	Lee	Dr Ray Chen, University of Texas at Austin, (512) 471-7035	Dr Chad Noddings, MCC, (512) 338-3769	WD(D)M Devices	Fast light wave switching for communication networks.
2303C	Polymer Chemistry	Lee	Dr Larry Dalton, University of Southern California, (213) 740-8768	Michael Salour, TACAN Corporation, (619) 438-1010	EO materials and associated processing technologies	Development of electro-optical devices for photonic applications in communications.
2303C	Polymer Chemistry	Lee	Dr Larry Dalton, University of Southern California, (213) 740-8769	John Kenney, ROI Technology, (415) 323-1403	EO materials and associated processing technologies	Development of electro-optical devices for photonic applications in communications.
2303C	Polymer Chemistry	Lee	Dr Larry Dalton, University of Southern California, (213) 740-8770	Robert Mustacich, RVM, (805) 964-3368	EO materials and associated processing technologies	Development of electro-optical devices for photonic applications in communications.
2303C	Polymer Chemistry	Lee	Dr Larry Dalton, University of Southern California, (213) 740-8771	Deacon Research, Gemfire Corporation, (415) 493-6100	EO materials and associated processing technologies	Development of electro-optical devices for photonic applications in communications.
2303C	Polymer Chemistry	Lee	Dr Steve Forrest, Princeton, (609) 258-4532	Dr Vladimir Ban, President, PD-LD Inc., (609) 924-7979	OVPD process	Production of organic waveguide optical modulators for advanced optoelectronics.
2303C	Polymer Chemistry	Lee	Dr Steve Forrest, Princeton, (609) 258-4532	Mr Steven Abramson, Universal Display Corp., (610) 617-4010	OVPD process	Development of display technologies based on organic emitters used for military displays.
2303C	Polymer Chemistry	Lee	Dr Alan Heeger, University of California at Santa Barbara, (805) 893-3184	Steve Coranleri, Uniax Corp., (805) 562-9293	Analytical model for the polymer grid triode	BMDO funded SBIR program on polymer grid triode arrays for advanced signal processing.

Subarea	Title	PM	Performer	Customer	Result	Application
2303C	Polymer Chemistry	Lee	Dr Alan Heeger, University of California at Santa Barbara, (805) 893-3184	Dr Patrick Hood, WL/MLPJ, (513) 255-3808	Charge transfer induced optical nonlinearity	Materials for sensor and eye protection against laser threat.
2303C	Polymer Chemistry	Lee	Dr Alex Jen, ROI Technologies, (908) 422-3709	Dr Paul Ashley, Army Redstone Arsenal, (205) 876-7484	Active Polyimides for EO applications	Development of electro-optical fiber gyro for missile applications.
2303C	Polymer Chemistry	Lee	Dr Alex Jen, ROI Technologies, (908) 422-3709	Dr Geoffrey Lindsay, Navy China Lake, (619) 939-1630	Active Polyimides for EO applications	Development of electro-optical fiber gyro for missile applications.
2303C	Polymer Chemistry	Lee	Dr Alex Jen, ROI Technologies, (908) 422-3709	Dr Richard Lytel, Akzo Nobel Electronics, (408) 752-1801	High Temperature polyimide passive waveguides	Development of optical thermal switches for communication networks.
2303C	Polymer Chemistry	Lee	Dr Frank Karasz, University of Massachusetts, (413) 545-4783	M. Chipalkatti, Osram/Sylvania, (508) 750-1578	Light emitting polymers and blends	Display and lighting technologies for C3I applications.
2303C	Polymer Chemistry	Lee	Dr Frank Karasz, University of Massachusetts, (413) 545-4784	Ted Kirchner, Foster Miller, (617) 290-0992	Light emitting polymers and blends	Developing flexible, hemetically sealed light emitting diodes (LEDs) for conformal display applications
2303C	Polymer Chemistry	Lee	Dr Frank Karasz, University of Massachusetts, (413) 545-4785	Andrew Purdes, Texas Instruments, (214) 995-5559	Light emitting polymers and blends	Commercial polymer light emitting diodes (LEDs) for flat panel and conformal displays and other applications.
2303C	Polymer Chemistry	Lee	Dr Hilary Lackritz, Purdue University, (415) 493-6100	Dr John Zetts, WL (513) 255-4474, ext 3212	EO Measurement during in-situ poling	Development of electro-optical devices for optical signal processing in military photonic applications.
2303C	Polymer Chemistry	Lee	Dr Hilary Lackritz, Purdue University, (415) 493-6100	Dr Warren Hermann, (301) 342-9114, Naval Air Development Ctr.	EO Measurement during in-situ poling	Development of electro-optical devices for optical signal processing in military photonic applications.
2303C	Polymer Chemistry	Lee	Dr Hilary Lackritz, Purdue University, (415) 493-6100	Ferris Lipscomb, Akzo Nobel, (408) 752-1805	EO Polymer Poling Dynamics	Fabrication of electro-optical devices for communications
2303C	Polymer Chemistry	Lee	Dr Seth Marder, California Institute of Technology, (818) 395-2829	Dr Alex Jen, ROI Technologies, (908) 422-3709	Thiophene containing chromophores	Development of device ready electro-optical polymer systems for advanced optical communications.
2303C	Polymer Chemistry	Lee	Dr Seth Marder, California Institute of Technology, (818) 395-2830	Dr Chris Ristich, WL/MLPJ, (513) 255-3808	Phthalocyanine and naphthalocyanine compounds for optical limiting applications	Sensor protection in near infrared range and eye protection in visible range.

Subarea	Title	PM	Performer	Customer	Result	Application
2303C	Polymer Chemistry	Lee	Dr John Pojman, University of Southern Mississippi, (601) 266-5035	Dr Michael DeRosa, WL/MLPJ, (513) 255-3808	Optical polymer with gradient NLO dyes	Laser hardening for eye and sensor protection.
2303C	Polymer Chemistry	Lee	Dr John Pojman, University of Southern Mississippi, (601) 266-5035	Dr Ed Berman, Boston Optical Fiber, (508) 647-4800	GRIN optical fiber preform	Gradient refractive index (GRIN) optical fiber manufacturing for communication networks.
2303C	Polymer Chemistry	Lee	Dr Paras Prasad, SUNY-Buffalo, (716) 645-6800	Dr Ryszard Burzynski, Laser Photonic Technologies, (716) 688-8251	Low optical loss chromophore, APSS	Development of low optical loss electro-optical polymers for photonic applications.
2303C	Polymer Chemistry	Lee	Dr Paras Prasad, SUNY-Buffalo, (716) 645-6801	Dr Thomas Dougherty, Roswell Park Cancer Institute, (716) 845-8577	Two-photon photodynamic therapy using efficient two-photon chromophores	Photodynamic therapy for cancer treatment.
2303C	Polymer Chemistry	Lee	Dr Paras Prasad, SUNY-Buffalo, (716) 645-6802	Technology Transfer Office, Dan Massing, (716) 645-3811	Multiphasic composites for broad based lasing	Development of advanced laser devices for use in C4I applications.
2303C	Polymer Chemistry	Lee	Dr Paras Prasad, SUNY-Buffalo, (716) 645-6803	Technology Transfer Office, Dan Massing, (716) 645-3812	Two-photon 3D optical storage scheme	High density optical data storage for C3I applications.
2303C	Polymer Chemistry	Lee	Dr Paras Prasad, SUNY-Buffalo, (716) 645-6804	Dr Ryszard Burzynski, Laser Photonic Technologies, (716) 688-8251	Sol Gel composites photonically active	High density optical data storage for C3I applications.
2303C	Polymer Chemistry	Lee	Dr John Reynolds, University of Florida, (352) 392-9151	Dr Tom Guarr, Gentex Corporation, (616) 772-1590, ext 434	Dual color electrochromic devices	Electrochromic devices for auto industry and in aircraft cockpits.
2303C	Polymer Chemistry	Lee	Dr Dan Sandman, University of Mass at Lowell, (508) 934-3835	Dr Thomas Cooper, WL/MLPJ, (513) 255-3808	Photochromic molecules	Optical limiting systems for sensor and eye protection.
2303C	Polymer Chemistry	Lee	Dr Charles Spangler, University of Montana, (406) 994-4801	Mr Robert Goedart, Army TACOM, (313) 574-5444	Monomers and copolymers optical polymers	SBIR program on sensor/eye protectors in windscreen or goggles.
2303C	Polymer Chemistry	Lee	Dr Charles Spangler, University of Montana, (406) 994-4801	Dr Ryszard Burzynski, Laser Photonic Technologies, (716) 688-8251	New multifunctional copolymers with blue electroluminescence	Development of blue emitters for flat panel displays on board aircraft.
2303C	Polymer Chemistry	Lee	Dr Bill Steier, University of Southern California, (213) 740-4415	Dr W. Bischel, Deacon Research, (415) 493-6100	Polymer waveguide fabrication technology	Proprietary applications in using active and passive polymer waveguides in display applications.

Subarea	Title	PM	Performer	Customer	Result	Application
2303C	Polymer Chemistry	Lee	Dr Bill Steier, University of Southern California, (213) 740-4416	Dr Y. Shi, TACAN Corp., (619) 438-1010	Infrared power handling limits of polymer waveguides	Development of electro-optical devices for optical communication networks.
2303C	Polymer Chemistry	Lee	Dr Mrinal Thakur, Auburn University, (334) 844-3326	Dr Steve Caracci, WL/MLPO, (513) 255-4474	Single crystal thin films and processing	Voltage sensor on microelectronic chips for advanced electronics.
2303C	Polymer Chemistry	Lee	Dr Mrinal Thakur, Auburn University, (334) 844-3326	Dr Gary Bjorkland, Optivision Inc., (408) 855-0221	Single crystal films coated on optical fiber	Organic in-line fiber modulator for high-speed signal processing.
2303C	Polymer Chemistry	Lee	Dr T-S Wu, Hughes Research Laboratory, (310) 317-5901	Harvey Wagner, Lockheed-Martin, (610) 354-6160	High birefringence LC molecules	Advanced tunable optical filter for 3-5 micron applications.
2303C	Polymer Chemistry	Lee	Dr T-S Wu, Hughes Research Laboratory, (310) 317-5901	Dr J. Y. Liu, Macro-Vision Communications, (303) 939-0027	High birefringence LC molecules	Development of high-speed and high-contrast liquid crystal (LC) modulators for communication applications at 1.5 micron wavelength.
2303D	Chemical Reactivity & Synthesis	Kozumbo	William Bannister, (541) 934-3682, University of Mass. at Lowell	Douglas Nelson, (904) 283-3742, WL/FI, Tyndall AFB, FL	New, non-volatile, low ozone depletion potential (ODP) candidate material	Fire suppression on board aircraft in flight.
2303D	Chemical Reactivity & Synthesis	Roach	David Awschalom, University of California at Santa Barbara	Ken Babcock, Digital Instruments, Inc.	Submicron current imaging technique using magnetic force spectroscopy	Inspection and characterization of buried conductors for use in integrated electronics for aircraft.
2303D	Chemical Reactivity & Synthesis	Roach	David Awschalom, University of California at Santa Barbara	Lucien Ghislein, Digital Instruments, Inc.	Bent 100-nm near-field optical fiber cantilevers for existing atomic force microscopy (AFM) instruments	Room-temperature scanning near-field optical imaging of integrated laser structures for optoelectronics.
2303E	Molecular Dynamics	Berman	Murad, Dressler, Levandier, Williams, PL/GP, (617) 377-3176	AF SMC-O Kenneth Moe, (310) 363-5697, AFSPACECOM	Measured energy dependence of O2+, NO+, N2+, + Na charge transfer cross sections	Incorporation into code to determine infrared backgrounds and scintillations for DSMP and other satellites.
2303E	Molecular Dynamics	Berman	Murad, Dressler, Levandier, Williams, PL/GP, (617) 377-3176	AF SMC-O Kenneth Moe, (310) 363-5697, AFSPACECOM	Kinetic data and infrared backgrounds attributable to ions modeled and incorporated into SOCRATES code	Used to determine interactions of spacecraft with surroundings and signatures.
2303E	Molecular Dynamics	Berman	Murad, Dressler, Levandier, Williams, PL/GP, (617) 377-3176	ESC/TNG - Lt Mat Wojewuczki	SOCRATES code for predicting spacecraft interactions	Used in Project Heat.
2303E	Molecular Dynamics	Berman	Viggiano, Morris, PL/GP, (617) 377-4028	Naval Strategic Systems Program Office, Carlos Lopez	Boundary layer plasma prediction code results, shock tunnel data	Prediction of plasma levels around reentry vehicles and radio blackout implications.
2303E	Molecular Dynamics	Berman	Viggiano, Morris, PL/GP, (617) 377-4028	Lockheed-Martin Missiles and Space Corp., Dr J. W. Meyer, (408) 756-7881	Plasma chemistry reaction rates	Input for plasma prediction codes for reentry blackout and signatures.

Subarea	Title	PM	Performer	Customer	Result	Application
2303E	Molecular Dynamics	Berman	Viggiano, Morris, PL/GP, (617) 377-4028	BMDO/AQS, Dr Paul Temple, (703) 604-0357	Reentry wake phenomenology results and code predictions	Determination of impact of reentry wakes on BMD systems, sensors, algorithms, and architectures.
2303E	Molecular Dynamics	Berman	Ballenthin, Viggiano, Gosselin, Meads, Thorn, PL/GP, (617) 377-4028	SMC/CL, Launch Programs SPO, Capt B. Laine, Col J. L. Buzzatto; Dr Martin Ross, Aerospace Corp., (310) 336-0360	Mass spectrometric measurements of chlorine chemistry and ozone depletion in rocket plumes	Determination of Titan IV environmental impact.
2303E	Molecular Dynamics	Berman	Viggiano, Morris, Dotan, PL/GP, (617) 377-4028	PL/GP, Dr Jack Jasperse, (617) 377-3083, and Dr Dave Anderson	Kinetics of ion-molecule reactions at thermospheric temperatures	Improved accuracy of ionospheric prediction models.
2303E	Molecular Dynamics	Berman	Ballenthin, Miller, Calo, PL/GP, (617) 377-4028	WL/POSF, Dr Mel Roquemore, (513) 255-6813	Neutral composition of combustion products from propane/air/halon mixtures	Personnel safety of proposed halon substitute suppressants.
2303E	Molecular Dynamics	Berman	Ballenthin, Miller, Viggiano, PL/GP, (617) 377-4028	NASA AEAP Program, Dr Brian Toon, (415) 604-5971	Trace gas composition flight corridors	Environmental impact of civil and military air fleet in upper troposphere.
2303E	Molecular Dynamics	Berman	Katayama, Welsh, Thomas, Dentamaro, PL/GP, (617) 377-5088	AEDC, Dr Jim Drake, (615) 454-7694	Collisional quenching rates of molecular excited states	Modeling and measurement of rocket plume optical signatures.
2303E	Molecular Dynamics	Berman	Dr Blumberg, PL/GP, (617) 377-2951	SMC/MTAX, Capt Dave O'Donnell, (310) 363-0267	Analysis of laboratory and CIRRIS 1A data and IBSS data on IR atmospheric backgrounds	Determination of task statement for SBIRS Phenomenology Exploitation Program.
2303E	Molecular Dynamics	Berman	Dr Blumberg, PL/GP, (617) 377-2951	BMDO, MSX Program, Col Bruce Guilmain, (703) 697-4025	Analysis of laboratory and CIRRIS 1A data and IBSS data on IR atmospheric backgrounds	Determination of monthly mission plan for MSX satellite operations.
2303E	Molecular Dynamics	Berman	Dr Blumberg, PL/GP, (617) 377-2951	Sandia National Laboratory, Dr Duane Landa, (505) 845-8904	Analysis of visible wavelength backgrounds from transient glows in the mesosphere	Tasking operational satellite data collections.
2303E	Molecular Dynamics	Berman	Dr Blumberg, PL/GP, (617) 377-2951	Dr Bill Frederick, (703) 693-1836, BMDO/TR	Analysis of laboratory and CIRRIS 1A data and IBSS data on IR atmospheric backgrounds	Determination of IR background predictive code requirements.
2303E	Molecular Dynamics	Berman	Dr Blumberg, PL/GP, (617) 377-2951	Institute for Defense Analysis, Dr Bill Jeffrey, (703) 845-2136, MSTI-3 Chief Scientist	Analysis of laboratory and CIRRIS 1A data and IBSS data on IR atmospheric backgrounds	Determination of mission plan and weekly planning for MSTI-3 satellite operations.

Subarea	Title	PM	Performer	Customer	Result	Application
2303E	Molecular Dynamics	Berman	Hager, PL/LIDB, (505) 846-0718	AFMC/Israel Ministry of Defense, Dr S. Shapiro, A. Yogev, Weizmann Institute	Photolytic iodine monobromide 2.7 mm laser	Joint US/Israel project for a solar pumped IBr laser.
2303E	Molecular Dynamics	Berman	Hager, PL/LIDB, (505) 846-0718	PL/LIDB COIL laser group, Dr Keith Truesdell, (505) 846-5047	Ringdown spectroscopy of states of O2	Calibration of yield of O2 (1D) in COIL generator.
2303E	Molecular Dynamics	Berman	Hager, PL/LIDB, (505) 846-0718	ABL SPO, Capt Jeff Moller, (505) 846-7658; Bill Thompson, (505) 846-2251, PL/LIDB COIL laser group; Dr Keith Truesdell, (505) 846-5047	Demonstration of mode locking of COIL	Pulsed COIL illuminator for Airborne Laser.
2303E	Molecular Dynamics	Berman	Suri, PL/RKS, (805) 275-5952	National Cancer Institute, Dr V. L. Narayanan, Chief, Drug Synthesis and Chemistry Branch, (301) 496-8795	Novel strained ring formate compound	Testing as anti-cancer and anti-AIDS agent.
2303E	Molecular Dynamics	Berman	Suri, PL/RKS, (805) 275-5952	Morton Thiokol Inc., Dr Robert Wardle, (801) 863-6156	Synthetic procedure for preparing PGN	Polymer binder for use in solid rocket motors.
2303E	Molecular Dynamics	Berman	Boatz, PL/RKS, (805) 275-5230	Alliant Techsystems, Dr K. O. Hartman, (304) 726-5114, Technical Director, Insensitive Munitions	GAMESS electronic structure computation program	Computational modeling of energetic compounds.
2303E	Molecular Dynamics	Berman	Petrie, PL/RKS, (805) 275-5759	PL/RKS, Tom Hawkins, (805) 275-5449	Novel hydroxyl-ammonium salts of nitroformate and dinitramide	Oxidizers for solution propellants for nonhalogenated propellant systems.
2303E	Molecular Dynamics	Berman	Rodgers, PL/RKS, (805) 275-5623	NASA Lewis, Bryan Palaszewski, (216) 977-7493	Candidate HEDM propellants	Fuels and Space Propellants program to develop higher density, higher Isp propellants.
2303E	Molecular Dynamics	Berman	Wucherer, PL/RKS, (805) 275-5759	TRW, Dave Byers, (310) 814-8848	Energetic hydrocarbon additives to RP-1 and monopropellant formulations	For use as satellite propellants.
2303E	Molecular Dynamics	Berman	Heaven, Emory University, (217) 333-3574	ABL SPO, Capt Jeff Moller, (505) 846-7658; PL/LIDB COIL laser group, Dr Keith Truesdell, (505) 846-5047	Measurement at 150 K of rate constants for determining iodine atom equilibrium	Computer modeling and optimization of COIL laser systems.

Subarea	Title	PM	Performer	Customer	Result	Application
2303E	Molecular Dynamics	Berman	Davis, Physical Sciences Inc., (508) 689-0003	ABL SPO, Capt Jeff Moller, (505) 846-7658; PL/LIDB COIL laser group, Dr Keith Truesdell, (505) 846-5047, Charlie Helms	Tunable diode-laser based diagnostic to sensitively monitor H2O, O2 (1D), and I*	Accurate measurement of COIL performance parameters and improved of COIL laser operation.
2303E	Molecular Dynamics	Berman	Davis, Physical Sciences Inc., (508) 689-0003	AFMC/Israel Ministry of Defense, Dr S. Shapiro, A. Yogev, Weizmann Institute	Tunable diodes to sensitively monitor H2O, O2 (1D), and I*	Accurate measurement of COIL performance parameters and improved of COIL laser operation.
2303E	Molecular Dynamics	Berman	Davis, Physical Sciences Inc., (508) 689-0003	Dr Willy Bonn, DLR, 011-49-711-686272	Diode laser based diagnostic for water vapor	Improved development and scaling of COIL laser.
2303E	Molecular Dynamics	Berman	Davis, Physical Sciences Inc., (508) 689-0003	AFMC/Israel Ministry of Defense, Dr Z. Rosenwaks, Ben Gurion University, 972-7-6278994	Tunable diode-laser based diagnostic to sensitively monitor H2O, O2 (1D), and I*	Accurate measurement of COIL performance parameters and improved of COIL laser operation.
2303E	Molecular Dynamics	Berman	Davis, Physical Sciences Inc., (508) 689-0003	AEDC, Kevin Zysk, (615) 454-6507	High-temperature diagnostic for detecting water vapor	Diagnostic of wind tunnel performance and flow visualization.
2303E	Molecular Dynamics	Berman	Davis, Physical Sciences Inc., (508) 689-0003	NASA Langley, John Barrick, (757) 864-5831	Diode-based sensitive diagnostic for water vapor	Used in system to determine the mixing between the stratosphere and troposphere.
2303E	Molecular Dynamics	Berman	Davis, Physical Sciences Inc., (508) 689-0003	Dr Bill McDermot, Rocketdyne, Charlie Clendening, TRW, (818) 586-4182	Tunable diode-laser based diagnostic to sensitively monitor H2O, O2 (1D), and I*	Accurate measurement of COIL performance parameters and improved of COIL laser operation.
2303E	Molecular Dynamics	Berman	Nesbitt, University of Colorado, (303) 492-8857	Dr Michael McClendon, Hewlett-Packard, (707) 577-3482	Infrared spectroscopic methods and methods for handling isotopes	In situ calibration standard for optical spectrum analyzers.
2303E	Molecular Dynamics	Berman	Nesbitt, University of Colorado, (303) 492-8857	Dr Daniel Oh, (505) 984-1322, Southwest Sciences Inc.	Precise determination of OH dipole moment function	Developing methods to monitor OH in the troposphere.
2303E	Molecular Dynamics	Berman	Nesbitt, University of Colorado, (303) 492-8857	Dr Robert Curl, (713) 527-4816, Rice University	Precise determination of OH dipole moment function	Controlling smokestack pollution by monitoring OH and reducing NOx with thermal de-NOx process
2303E	Molecular Dynamics	Berman	Nesbitt, University of Colorado, (303) 492-8857	Appleton Research Laboratory, Dr John Ballard	Determination of radiative lifetime of O2 (1D)	Atmospheric transmission in the infrared at 1.3 mm.
2303E	Molecular Dynamics	Berman	Nesbitt, University of Colorado, (303) 492-8857	PL/LIDB, Harold Miller, (805) 853-3286	Determination of radiative lifetime of O2 (1D)	Calibration of O2 (1D) generators for COIL devices.

Subarea	Title	PM	Performer	Customer	Result	Application
2303E	Molecular Dynamics	Berman	Nesbitt, University of Colorado, (303) 492-8857	Marlowe Engineering, Greg Jewitt, (303) 443-4321	Sensitive infrared spectroscopic methods	Measurement of water vapor in high-efficiency hydrogen-oxygen combustion systems.
2303E	Molecular Dynamics	Berman	Nesbitt, University of Colorado, (303) 492-8857	Dr Warren Wiscombe, (301) 286-8499, NASA Goddard	Binding energies and spectroscopy of small clusters of water molecules	Determination of the infrared opacity of the atmosphere (infrared transmission).
2303E	Molecular Dynamics	Berman	Nesbitt, University of Colorado, (303) 492-8857	Mike Lang, (303) 550-7785, Environmental Optical Sensors, Inc.	Spectroscopic data on vibrational overtones	HCN gas reference cells for calibration of optical devices.
2303E	Molecular Dynamics	Berman	Oka, University of Chicago, (312) 702-7070	Dr Tom Anthony, (518) 387-6160, General Electric	Low temperature spectroscopy of solids	Spectroscopy of isotopically pure diamond for high thermal conductivity materials.
2303E	Molecular Dynamics	Berman	Field, MIT Lincoln Laboratory, (617) 253-1489	Dr Steven Lipson, (617) 377-7380, PL/GPOS	Spectroscopic methods to determine mechanisms of formation of observed NO distributions	Model of NO emissions in the atmosphere for determining infrared backgrounds for surveillance systems.
2303E	Molecular Dynamics	Berman	Field, MIT Lincoln Laboratory, (617) 253-1489	Dr Steven Davis, (508) 689-0003, Physical Sciences Inc.	Techniques to monitor vibrationally excited iodine molecules	Development of optically pumped lasers for countermeasures and other applications.
2303E	Molecular Dynamics	Berman	Whitefield, University of Missouri-Rolla, (314) 341-4340	SMC/CL, Launch Programs SPO, Capt B. Laine, Col J. L. Buzzatto; Dr Martin Ross, Aerospace Corp., (310) 336-0360	Determination of particulate size distribution in exhaust of Titan IV solid rocket motors	Determination of Titan IV environmental impact.
2303E	Molecular Dynamics	Berman	Whitefield, University of Missouri-Rolla, (314) 341-4340	WL/PO, M. Roquemore, (513) 255-6813, Bill Harrison, Capt Barry Kiel; McDonnell Douglas, Glenn Harper	Determination of particulate size distribution and composition in jet exhaust using new fuel additives	Test of effectiveness of novel JP8 + 100 fuel to improve performance of old jet engines.
2303E	Molecular Dynamics	Berman	Copeland, SRI International, (415) 326-6534	Joe Marshall, Joan Pallix, (650) 604-0332, Eloret Corp.	O-atom detection and ozone handling methods	Analysis of degradation of waterproofing agents on spacecraft materials.
2303E	Molecular Dynamics	Berman	Minton, Montana State University, (406) 994-5394	Dr Ranty Liang, (818) 354-6314, Jet Propulsion Laboratory	Protocol for atomic oxygen testing of materials in ground-based facilities	Assessment of degradation of materials to be used in space, on spacecraft and satellites.
2303E	Molecular Dynamics	Berman	Zewail, Caltech, (818) 395-6536	Dr Jack Syage, (310) 336-1583, Aerospace Corp.	Reactivity, properties, and dynamics of atmospheric cluster ions	Assessment of impact of jet and rocket exhaust on the atmosphere.
2303E	Molecular Dynamics	Berman	Zewail, Caltech, (818) 395-6536	Dr Terry Cole, (818) 354-5458, Jet Propulsion Laboratory	Damage limits of CCD detectors	CCD detectors for use in satellites and spacecraft.

Subarea	Title	PM	Performer	Customer	Result	Application
2303E	Molecular Dynamics	Berman	Dlott, University of Illinois, (217) 333-3574	Dr Robert Sciciliano, (607) 774-3333, Anitec, Inc.	Use of explosive films in polymer layer to facilitate laser ablation	Method for using lasers for direct computer-to-printing plate transfer imaging.
2303E	Molecular Dynamics	Berman	Dlott, University of Illinois, (217) 333-3574	Dr Jim Jonza and Dr Dwayne Labrake, 3M, Inc., (512) 984-5406	Laser shock wave generation and diagnostics	Use in manufacturing printed circuit boards.
2303E	Molecular Dynamics	Berman	Casassa, NIST, (301) 975-2371	Ed Murad, PL/GP, (617) 377-3176	OH state distributions from O + H2O reaction	Modeling of exhaust plumes and locating projectiles based on extent of IR plume.
2303E	Molecular Dynamics	Berman	Casassa, NIST, (301) 975-2371	Robert Hinebaugh, (614) 522-7990, (for BMDO), AF Aerospace Guidance and Metrology Center	Spectroscopic (REMPI) measurements on water	Low pressure water measurement standards.
2303E	Molecular Dynamics	Berman	Casassa, NIST, (301) 975-2371	Robert Hinebaugh, (614) 522-7990, (for BMDO), AF Aerospace Guidance and Metrology Center	Spectroscopic methods for wind tunnel tests	Identification of contaminant species in weapons testing environment.
2303E	Molecular Dynamics	Berman	Casassa, NIST, (301) 975-2371	Dave Crosley, (415) 859-2395, SRI International	OH state distributions from O + H2O reaction	Analysis of LIDAR measurements of tropospheric OH for interpreting ozone concentrations.
2303E	Molecular Dynamics	Berman	Bowers, University of California at Santa Barbara, (805) 893-2893	Dr Jim Scrivens, 011-44-1642-432287, ICI Polymers	Mass spectroscopic method of determining size distribution of chains in polymers	Control of production and properties of polymers.
2303E	Molecular Dynamics	Berman	Wittig, Reisler, USC (213) 740-7368	Dr Chris Capellos, (201) 724-3550, ARDEC	Gas-phase and gas-surface collision energy transfer rates	Models of combustion in gun propellants.
2303E	Molecular Dynamics	Berman	Benard, Rockwell International, (805) 373-4278	Robert Ondercin, (937) 255-4474, ext. 3211, WL/ML	Use of azides to produce carbon nitride films	Optically transmitting, abrasion resistant material for IR windows on domes on weapons and aircraft.
2303F	Theoretical Chemistry	Berman	Kalia, Louisiana State University, (504) 388-1342	Dr Jeremy Broughton, (202) 767-4069, Naval Research Laboratory	Interatomic potentials for various polymorphs of silica, and interaction potentials for crystalline quartz	Simulations of long time transients in quartz crystal accelerometers.
2303F	Theoretical Chemistry	Berman	Kalia, Louisiana State University, (504) 388-1342	Dr James Patterson, (206) 865-3683, Boeing Corp.	Implementation of Fast Multipole Method	Parallel implementation of electromagnetic scattering calculations for simulating aircraft radar cross sections.
2303F	Theoretical Chemistry	Berman	Rabitz, Princeton University, (609) 258-3917	Dr Paul Saxe, (619) 546-5509, Biosym Technologies Inc.	Sensitivity analysis tools that show how potential surface features influence molecular structural observables	Commercial software package for molecular modeling for biostructural applications.
2303F	Theoretical Chemistry	Berman	Alexander, University of Maryland, (301) 405-1823	Dr Byron Lengsfield, IBM, (408) 927-2032	Genetic algorithm minimization routine	Incorporated into “Mulliken” statistical mechanics program.

Subarea	Title	PM	Performer	Customer	Result	Application
2303F	Theoretical Chemistry	Berman	Pulay, University of Arkansas, (501) 575-4601	Dr Benny Johnson, (412) 828-7106, Q-Chem, Inc.	Redundant Coordinate Geometry Optimization Method	Incorporated into quantum chemistry software package.
2303F	Theoretical Chemistry	Berman	Pulay, University of Arkansas, (501) 575-4601	Pacific Northwest National Laboratory, Dr Bruce Garrett, (509) 375-2587	Redundant Coordinate Geometry Optimization Method	Incorporated into quantum chemistry software package.
2303F	Theoretical Chemistry	Berman	Carter, UCLA, (310) 206-5118	Dr Michael Gardos, (310) 616-9890, Hughes Electro-Optical Systems	Calculations to determine the mechanism of hydrogen adsorption and desorption on silicon surfaces	Friction and wear of silicon surfaces for MEMS applications.
2303F	Theoretical Chemistry	Berman	Scuseria, Rice University, (713) 527-4746	Dr Mike Frisch, (412) 279-6700, Gaussian, Inc.	Gaussian very Fast Multipole Method	Incorporated into leading quantum chemistry software package for improved scaling of calculations on large systems.
2303F	Theoretical Chemistry	Berman	Schaefer, University of Georgia, (706) 542-2067	Dr Tom Miller, (617) 377-4028, PL/GPID	Electron affinity and energetics calculated for a full series of fluorine-containing radicals	Used in WAKE code for predicting electron densities (and radar cross sections) in reentry plasmas containing teflon.
2303F	Theoretical Chemistry	Berman	Voth, University of Pennsylvania, (215) 898-3048	Capt Scott Wierschke, (805) 275-5334, DOD High Performance Computing Centers	Centroid Molecular Dynamics code	Available to DoD users for treating dynamics problems that include tunneling.
2303F	Theoretical Chemistry	Berman	Gordon, Iowa State, (515) 294-0452	Capt Scott Wierschke, (805) 275-5334, DOD High Performance Computing Centers	MacMolPlt graphical user interface	Visualization of molecules, reaction paths from electronic structure calculations.
2303F	Theoretical Chemistry	Berman	Gordon, Iowa State, (515) 294-0452	Apple Computers, Scott Jenkins, Chris Nebel, (408) 974-5211	GAMESS program for the Macintosh platform	Inexpensive and accessible method for electronic structure calculations and educational purposes.
2303F	Theoretical Chemistry	Berman	Gordon, Iowa State, (515) 294-0452	Dr Walter Stevens, (301) 975-5968, NIST	Effective fragment method for calculating effects of solvation	Used to mimic enzyme-substrate interactions.
2303F	Theoretical Chemistry	Berman	Morokuma, Emory University, (404) 727-2180	Dr Ed Murad, (617) 377-3176, PL/GP	Potential energy surfaces for reactions involving H, N, C, and O	Analysis of contribution of isomers of HNCO to rocket plume emissions.
2303F	Theoretical Chemistry	Berman	Yarkony, Johns Hopkins University, (410) 516-4663	Dr G. Hager and Dr Robert Coombe, (303) 871-2436, University of Denver, PL/LI	Calculation of radiative lifetime of NCl (a)	Assessment of potential NCl-I* laser system.

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2303F	Theoretical Chemistry	Berman	Weare, University of California at San Diego, (619) 534-3286	Dr Todd Yates, (937) 255-9138, WL/ML	Parallel versions of Ab Initio Molecular Dynamics code	Calculation of properties of large chain polymers.
2303F	Theoretical Chemistry	Berman	Weare, University of California at San Diego, (619) 534-3286	Dr Steve Ashby and Dr Scott Kohn, Lawrence Livermore National Lab, (510) 423-2462	Parallel development of adaptive mesh solutions to partial differential equations	Improved grids for CFD calculations, quantum materials calculations, and ground water flow.
2303F	Theoretical Chemistry	Berman	Levine, Hebrew, U972-2-658-5260	Dr J. Murdoch, (216) 441-4100, General Electric	Algorithm for determination of a distribution of maximum entropy	Image enhancement of x-rays enabling lower dosages to be used in breast cancer screening.
2303F	Theoretical Chemistry	Berman	Bartlett, University of Florida, (352) 392-1597	Dr S. Ambadi, Motorola, (602) 655-4040	ACES II code for calculation of energetics of transient plasma species	Design of materials for plasma etching of semiconductors.
2303F	Theoretical Chemistry	Berman	Bartlett, University of Florida, (352) 392-1598	Dr Karl Christe, (805) 275-5194, Hughes STX	Predicted structure of trinitrotriazine	Synthesis of new high energy molecule.
2303F	Theoretical Chemistry	Berman	Bartlett, University of Florida, (352) 392-1599	Loker Hydrocarbon Institute, Dr George Olah, (213) 740-5976	Method for calculation of coupling constants incorporated in ACES II code	Assignment of NMR spectra of carbocations.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Johnathan Kiel, AL/OERT, Brooks AFB, TX, (210) 536-3583	American Type Culture Collection, Bobbie Brandon, (301) 881-2600, Head ATCC Patent Depository	Two mouse mammary tumor cell lines were genetically engineered that produce diazoluminomelanin & nitric oxide synthetase activity without dying	Cell lines were deposited for use by scientists interested in studying radiofrequency effects on tumor cell growth.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Jim Spain, AL/EQC, Tyndall AFB, FL, (904) 283-6058	US Army Corps of Engineers, Waterways Experiment Station, MI, Mr Herb Fredrickson, (601) 634-3716	Novel pathways for the degradation of nitroaromatic compounds were discovered and elucidated in bacterial strains	Information is for use in developing biotechnology for the safe destruction of explosives.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Jim Spain, AL/EQC, Tyndall AFB, FL, (904) 283-6059	ICI, Inc. Sid Saunders, (423) 855-7250; also, the National Test Site Director Alison Thomas, (904) 283-6303	Novel pathways for the degradation of dinitrotoluene were discovered and elucidated in bacterial strains	Information is for use in developing biotechnology to remediate nitro-based explosives in groundwater.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Benjamin Rockwell, Armstrong Lab, AL/OEDL, Brooks AFB, TX (210) 536-4790	American National Standard Institute (ANSI), Dr Wolbarsht, (919) 660-5670	New damage mechanisms were determined for retinal damage induced by laser pulses shorter than several nanoseconds	Information will help establish new laser safety standards, i.e., the maximum permissible exposure (MPE) limits of ultrashort laser pulses.

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2312A	Bioenvironmental Sciences	Kozumbo	Dr Benjamin Rockwell, Armstrong Lab, AL/OEDL, Brooks AFB, TX (210) 536-4790	Am. Conf. of Govt & Industrial Hygienists (ACGIH), Dave Sliney, (410) 671-3932	New damage mechanisms were determined for retinal damage induced by laser pulses shorter than several nanoseconds	Information will help establish new laser safety standards, i.e., the maximum permissible exposure (MPE) limits of ultrashort laser pulses.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Martin Alexander, Cornell University, Ithaca, NY, (607) 255-1717	Dupont, Newark, DE, Scott Cunningham; (302) 451-9138	Data was acquired indicating the bioavailability and toxicity of aging soil contaminants	Information will be used to establish environmental endpoints and health risks for soil contaminants and to reduce cost of decontaminating military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Martin Alexander, Cornell University, Ithaca, NY, (607) 255-1717	Roger Melton, Exxon, Houston, TX, (713) 965-4373	Data was acquired indicating the bioavailability and toxicity of aging soil contaminants	Information will be used to establish environmental endpoints and health risks for soil contaminants and to reduce cost of decontaminating military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Martin Alexander, Cornell University, Ithaca, NY, (607) 255-1717	Neta Hercyk, Conoco, Ponca City, OK, (405) 767-4182	Data was acquired indicating the bioavailability and toxicity of aging soil contaminants	Information will be used to establish environmental endpoints and health risks for soil contaminants and to reduce cost of decontaminating military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Martin Alexander, Cornell University, Ithaca, NY, (607) 255-1717	Arthur Stewart, Oak Ridge National Laboratory, Oak Ridge, TN, (423) 574-7835	Data was acquired indicating the bioavailability and toxicity of aging soil contaminants	Information will be used to establish environmental endpoints and health risks for soil contaminants and to reduce cost of decontaminating military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Martin Alexander, Cornell University, Ithaca, NY, (607) 255-1717	Sara McMillen, Chevron, San Francisco, CA, (510) 242-3485	Data was acquired indicating the bioavailability and toxicity of aging soil contaminants	Information will be used to establish environmental endpoints and health risks for soil contaminants and to reduce cost of decontaminating military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Martin Alexander, Cornell University, Ithaca, NY, (607) 255-1717	Dr David Nakles, Retec, Monroeville, PA, (412) 380-0140	Data was acquired indicating the bioavailability and toxicity of aging soil contaminants	Information will be used to establish environmental endpoints and health risks for soil contaminants and to reduce cost of decontaminating military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Martin Alexander, Cornell University, Ithaca, NY, (607) 255-1717	Bruce Krewinghaus, Shell, Houston, TX, FAX (713) 544-8727	Data was acquired indicating the bioavailability and toxicity of aging soil contaminants	Information will be used to establish environmental endpoints and health risks for soil contaminants and to reduce cost of decontaminating military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Martin Alexander, Cornell University, Ithaca, NY, (607) 255-1717	John Smith, Alcoa, Pittsburgh, PA, (412) 337-5432	Data was acquired indicating the bioavailability and toxicity of aging soil contaminants	Information will be used to establish environmental endpoints and health risks for soil contaminants and to reduce cost of decontaminating military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Rajesh Mehra, University of CA at Riverside, (909) 787-6473	University of California Toxic Substances Research and Teaching Program, Director's Office, UC-Davis, (916) 752-2097	Technical information was acquired enabling the development of synthetic genes for phytoremediation	Results will help develop biotechnology to remediate contaminated sites on military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Rajesh Mehra, University of CA at Riverside, (909) 787-6473	Dr Graham Bench, Lawrence Livermore National Laboratory, (510) 423-5155	Mutant yeast strain was developed that resists cadmium toxicity due to intracellular formation of cadmium sulfite crystallites	Results will help develop biotechnology to remediate contaminated sites on military bases.

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2312A	Bioenvironmental Sciences	Kozumbo	Dr Robert Lochmiller, Oklahoma State University, Stillwater, OK, (405) 744-9672	U. S. Fish and Wildlife Service, Tulsa, OK, Todd Adornato, (918) 581-7572	Information was acquired on the pathological effects in animals inhabiting contaminated sites	Data will be used in the preparation of guidelines for post-remediation monitoring of toxic waste sites on military bases.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Richard Guy, University of California at San Francisco, (415) 476-4830	Dr Robert Zendzian, (703) 305-5495, US Environmental Protection Agency, Office of Pesticide Programs	Database was developed for the derivation of algorithms for predicting skin absorption of toxic chemicals	Database will be used by EPA in predicting national safety standards for dermal exposure to toxic chemicals of interest to the Air Force.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Gerben Zylstra, Rutgers University, New Brunswick, NJ, (908) 932-8165, x320	Dr Rob Steffan, Envirogen, Inc., (609) 936-9300	Clones and gene sequences were established for the degradation of p-nitrobenzoate	Results will help in developing diagnostic probes to assess contaminated sites for presence of specific organisms that degrade nitroaromatic compounds of military importance.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Gerben Zylstra, Rutgers University, New Brunswick, NJ, (908) 932-8165, x320	Dr Rob Steffan, Envirogen, Inc., (609) 936-9300	Clones and gene sequences were established for the degradation of p-nitrophenol	Results will help in developing diagnostic probes to assess contaminated sites for presence of specific organisms that degrade nitroaromatic compounds of military importance.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Gerben Zylstra, Rutgers University, New Brunswick, NJ, (908) 932-8165, x320	Dr Rob Steffan, Envirogen, Inc., (609) 936-9300	Clones were established for degrading p-nitrophenol from Envirogen's bacterial strain P. Fluorescens ENV2030	Clones will be tested for use in commercial remediation of nitroaromatic compounds.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Gerben Zylstra, Rutgers University, New Brunswick, NJ, (908) 932-8165, x320	National Center for Biotechnology Information, Bethesda, MD, Leigh A. Riley, (301) 496-2475	Gene and protein sequences were determined for the degradative enzyme p-nitrophenol monooxygenase	Molecular sequences were added to the GenBank Database for use by other researchers investigating mechanisms to biodegrade nitroaromatic compounds of military importance.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Gerben Zylstra, Rutgers University, New Brunswick, NJ, (908) 932-8165, x320	National Center for Biotechnology Information, Bethesda, MD, Leigh A. Riley, (301) 496-2475	Gene and protein sequences were determined for the degradative enzymes p-nitrobenzoate reductase and hydroxylaminolyase	Molecular sequences were added to the GenBank Database for use by other researchers investigating mechanisms to biodegrade nitroaromatic compounds of military importance.
2312A	Bioenvironmental Sciences	Kozumbo	Dr David T. Gibson, University of Iowa, Iowa City, IA, (319) 335-7980	National Center for Biotechnology Information, Bethesda, MD, Leigh A. Riley, (301) 496-2476	Gene and protein sequences were determined for the degradative enzyme 2-nitrotoluene dioxygenase	Molecular sequences were added to the GenBank Database for use by other researchers investigating mechanisms to biodegrade nitroaromatic compounds of military importance.
2312A	Bioenvironmental Sciences	Kozumbo	Dr David T. Gibson, University of Iowa, Iowa City, IA, (319) 335-7980	Dr Domenic Paone, Sybron Chemicals, Roanoke, VA 1-800-859-2972	Genes for the 2-nitrotoluene dioxygenase enzyme were cloned from a bacterial strain	Results will improve the biodegradation of complex mixtures of nitroaromatic compounds of military importance.
2312A	Bioenvironmental Sciences	Kozumbo	Dr David T. Gibson, University of Iowa, Iowa City, IA, (319) 335-7980	Dr Jim Spain, AL/EQC, Tyndall AFB, FL, (904) 283-6058	Genes for the 2-nitrotoluene dioxygenase enzyme were cloned from a bacterial strain	Clones will be used in biodegradation and bioremediation studies with various aromatic and nitroaromatic compounds of military importance.

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2312A	Bioenvironmental Sciences	Kozumbo	Dr Cynthia A. Toth, Duke University Eye Center, (919) 684-5631	Dr Dave Sliney, Am. Conf. of Govt & Industrial Hygienists (ACGIH), (410) 671-3932	First histopathologic evidence is produced in retina that documents minimal level of pathologic response to ultrashort laser pulses	Data will be used to establish national laser safety standards, i.e., the maximal permissible exposure limits for ultrashort laser pulses.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Cynthia A. Toth, Duke University Eye Center, (919) 684-5631	Dr Dave Sliney, Am. Conf. of Govt & Industrial Hygienists (ACGIH), (410) 671-3932	First histopathologic evidence is produced of full thickness retinal damage from ultrashort laser pulses at relatively low energies	Data will be essential in establishing national laser safety standards for ultrashort laser pulses.
2312A	Bioenvironmental Sciences	Kozumbo	Drs Mark Witten, (520) 626-2610 and Dave Harris (520) 621-6271, University of Arizona, Tucson, AZ	Merck and Co., Inc. Dr Greg Wiederrecht (908) 594-6576	Substance-P protects the lung and immune system from damage by jet fuel	Substance-P will be tested as an immune stimulant and vaccine adjuvant to protect against chemically induced immune suppression.
2312A	Bioenvironmental Sciences	Kozumbo	Drs Mark Witten, (520) 626-2610 and Dave Harris (520) 621-6271, University of Arizona, Tucson, AZ	Glaxo Wellcome, Hertfordshire, United Kingdom, Dr J.N. McDonald, (44 (0) 1-438-745745)	Substance-P protects the lung and immune system from damage by jet fuel	Substance-P will be tested as an immune stimulant and vaccine adjuvant to protect against chemically induced immune suppression.
2312A	Bioenvironmental Sciences	Kozumbo	Drs Mark Witten, (520) 626-2610 and Dave Harris, (520) 621-6271, University of Arizona, Tucson, AZ	SciClone, Inc., Dr Tom Moore, (415) 949-5559	Substance-P protects the lung and immune system from damage by jet fuel	Substance-P will be tested as an immune stimulant and vaccine adjuvant to protect against chemically induced immune suppression.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Frank Witzmann, Indiana Univ-Purdue University, Columbus, IN 47203, (812) 348-7215	Dr Ray Grant, Proctor & Gamble Co., Cincinnati, OH, (513) 627-2179	Techniques were developed for large-scale two-dimensional protein electrophoresis and image analysis	Biotechnology will be used to research and develop drugs, pharmaceutical products and biological modifiers.
2312A	Bioenvironmental Sciences	Kozumbo	Dr Frank Witzmann, Indiana Univ-Purdue University, Columbus, IN 47203, (812) 348-7215	Dr N. Leigh Anderson, Large Scale Biology Corp., Rockville, MD, (301) 424-5989	Proteins were identified on two-dimensional electrophoretic maps	Data were added to the Tissue Effects Database under development at Large Scale Biology Corporation.
2312C	Chronobiology & Neural Adaptation	Haddad	Dr David Dinges, University of Penn. (215) 898-9949	F-117 Squadron, Holloman AFB, Lt Col Lex Brown, (505) 475-5927	Knowledge of the circadian system effects on vision	Night vision goggle use, and scheduling of night operations.
2312C	Chronobiology & Neural Adaptation	Haddad	Dr Greg Sutcliffe, Scripps Research Institute, (619) 784-8064	Digital Gene Technologies, Karl Hasel, (619) 552-1400	New method to automate gene expression	Used for medical diagnosis.
2313B	Perception & Cognition	Tangney	Dr Shute, Armstrong Laboratory, AL/HRT (210) 671-2734	Mr John Schuler, (210) 536-2034, Naval Post-Graduate Research and Development Ctr.	SMART, a model of student learning	Educational software for training of Navy sonar specialists.

Subarea	Title	PM	Performer	Customer	Result	Application
2313B	Perception & Cognition	Tangney	Dr Wesley Regian, Armstrong Laboratory, AL/HRT (210) 536-2034	Harvey Pantzis, (408) 373-0728, Brooks & Cole Publishers	Method for intelligent tutoring	IntelliTutor (TM) educational software for mid-level algebra, adaptable to AF technical training curricula.
2313B	Perception & Cognition	Tangney	Dr Martin Regan, York University, (416) 736-5627	Dr Wray, (617) 726-5537, Harvard Medical School	Tests of visual sensitivity to motion and texture.	Quality metric for flight simulation visuals; ophthalmologic screen for multiple sclerosis.
2313B	Perception & Cognition	Tangney	Dr Wolfe, Brigham and Women's College, (617) 732-7841	Dr Krebs, (408) 656-2543, Naval Post Graduate Research & Development Ctr.	Model of human visual attention	Evaluation of sensor fusion in false coloration of night vision displays.
2304A	Dynamics & Control	Jacobs	Prof A. Krener, University of California at Davis, (916) 752-3185	Dr Mark Myers, UTRC, Hartford, CT, (860) 727-7499	Bifurcation analysis tools and nonlinear controller design	Discovery of new stall precursor for use in feedback control in compressors.
2304A	Dynamics & Control	Jacobs	Prof J. Speyer, UCLA, (310) 206-4451	Applied Physics Laboratory, Laurel MD, (301) 953-6000, ext. 7605	New adaptive, robust, nonlinear estimator based upon universal linearization of spherical measurements in rectangular coordinates, kinematic pseudo-measurements, new circular target models, and enhanced filter robustness based on a dissipative inequality	Enhance performance of standard Navy missile. Robust terminal guidance laws to include new target models, randome refraction slope, etc.
2304A	Dynamics & Control	Jacobs	Prof L. Watson, Virginia Tech., (540) 231-7540	Dr Mark Myers, UTRC, Hartford, CT, (860) 727-7499	Homotopy algorithms and mathematical software	Bifurcation analysis of turbomachinery models.
2304A	Dynamics & Control	Jacobs	Profs E. Tracy and R. Brown, William and Mary (757) 221-3527	Dr R. Burne, Allied Signal, Columbia, MD, (410) 964-4159	New strategies for using symbol statistics to detect transitions in complex systems, e.g., noise driven turbulent flows	Early detection of rotating stall in turbines.
2304A	Dynamics & Control	Jacobs	Dr Harry Klopf, WL/AAC, (513) 255-7649	Dr Jim Morgan, WL 6.2 Program with Draper Lab., (513) 255-7650 Year one of a three-year contract	New residual gradient reinforcement learning algorithms	Improve filtering for GPS-INS sensor fusion problems.
2304A	Dynamics & Control	Jacobs	Prof M. Krstic, University of Maryland, (301) 405-5206	Dr Mark Myers, UTRC, Hartford, CT, (860) 727-7499	New adaptive nonlinear backstepping control design methodology	New control laws for stabilizing compressor rotating stall and surge are being evaluated experimentally on UTRC test rigs.
2304A	Dynamics & Control	Jacobs	Prof J. Tsitsiklis, MIT, jnt@athena.mit.edu	Dr Volker Tresp, 49-89-636-46310, Siemens, tresp@traun.zfe.siemens.de	Neurodynamic programming techniques	NDP techniques are applied to train and optimize feedback policies for administration and routing in ATM (asynchronous transfer mode) communication network, including the possibility of incorporating these methods in commercial ATM switches.

Subarea	Title	PM	Performer	Customer	Result	Application
2304A	Dynamics & Control	Jacobs	Prof M. Dahleh, MIT, (617) 253-3892 dahleh@lids.mit.edu	Dr Dragan Obradovic, 49-89-636-49499, Siemens, obrad@sava.zfe.siemens.de	Identification and control of nonlinear systems	Detection of tumors from EEG signals.
2304A	Dynamics & Control	Jacobs	Profs A. Laub and C. Kennedy, University of California at Santa Barbara, (805) 893-3616, cofund with Maj Schreck	Jim Huang, (617) 273-3388, Alphatech, Inc., Burlington, MA, jim.huang@alphatech.com	New algorithms for conditioning and statistical condition estimation	Sensitivity of optical flow calculations for automatic target recognition and image processing.
2304A	Dynamics & Control	Jacobs	Prof W. Rugh, Johns Hopkins University, (410) 516-7004	Paul Jackson, Applied Physics Laboratory, Laurel, MD, (410) 792-5000, ext. 8093	Gain scheduling: theory of hidden coupling terms and their avoidance	Evaluation of reduced-rate gain updating and hidden coupling terms in digital implementation of continuous time scheduled autopilot for STANDARD Missile-2 Block IVA upgrade.
2304A	Dynamics & Control	Jacobs	Prof A. Laub, University of California at Santa Barbara, (805) 893-3616, cofund with Major Schreck	Kevin Shortelle, (904) 371-8035, System Dynamics International, Gainesville, FL, sdi@afn.org	Fast algorithms and software for the solution of algebraic Riccati equations	Investigate benefits of new nonlinear estimation techniques for improving the accuracy of integrated navigation systems for the Air Force.
2304A	Dynamics & Control	Jacobs	Prof Allen Tannenbaum, University of Minnesota, (612) 625-6395	Dr Sal Cusumano, Phillips Laboratory, Kirtland AFB, NM, (505) 846-0463	Mathematical algorithms and software for image enhancement and smoothing (based on nonlinear invariant flow equations)	Software installed to examine efficacy of methodology for ABL tracking problems.
2304A	Dynamics & Control	Jacobs	Prof Allen Tannenbaum, University of Minnesota, (612) 625-6395	Steve Floeder, 3M Corporation, Minneapolis, MN, (612) 733-1015	Mathematical algorithms and software for image enhancement and smoothing (based on nonlinear invariant flow equations); new "snake" algorithm	Tools are being used for the purposes of enhancement smoothing, denoising, segmentation, shape recognition. Snake algorithms are used by 3M for visual inspection of defects in chemical webs.
2304A	Dynamics & Control	Jacobs	Dr M. Elgersma, Honeywell Technology Center, Minneapolis, MN, (612) 951-7208	Paul Samanant, Honeywell Technology Center, Minneapolis, MN, (612) 951-7270	Real-time 3D Min-Max pursuit evader algorithms	Hardware-in-the loop simulation using Intel i80960 processor in Honeywell Inertial Flight Management Unit (IFMU). Miniature IFMU is small enough for UAVs and missiles.
2304A	Dynamics & Control	Jacobs	Prof. Bill Perkins, Univ. of Illinois, (217) 333-0283, Prof. Juraj, Medanic, University of Illinois at Urbana, (217) 333-0283, Dr K. Wise, MDA, St Louis, (314) 232-4549	Pete Wise, (904) 882-2961, ext. 3337, AFDTC/MNAG, USAF, Eglin AFB, FL	Projective control/optimal control algorithms and software for designing simplified low order controllers which can perform at near optimal levels	Algorithms inserted in AUTOGAIN control design software and used in design of GNC system in Miniaturized Munition Technology (MMT) program. New approach saves hardware on 250 lb. bomb with hit-to-kill accuracy that can penetrate 8 ft. concrete.

Subarea	Title	PM	Performer	Customer	Result	Application
2304A	Dynamics & Control	Jacobs	Dr K. Wise, MDA, St Louis, (314) 232-4549	Kevin Citurs, MDA, St Louis and NASA Dryden, (314) 232-3918	New algorithms and software for analyzing robustness and calculating exact stability margins for real parameter uncertainty	Algorithms inserted in ROBUSTR software package and used in the X-36 program (small tailless UAV) to analyze flight control sensitivity to uncertainties in the aerodynamic coefficients.
2304B	Physical Mathematics & Applied Analysis	Nachman	Dr John Maddocks Math U Md College Park MD 20742 (301) 405-7641	Dr Carlos Padilla Moldyn, Inc. 955 Mass. Ave Cambridge MA 02139 (617) 354-3124	Upgraded modern continuum mechanics by the invention of the Impetus-Striction Method and applied this to nonstandard Hamiltonian description of flexible molecular chains	Moldyn seeks to predict the dynamics of certain long, complex molecules which are key ingredients of laser protection visors contemplated by WL and for which WL awarded Moldyn an SBIR Phase II.
2304B	Physical Mathematics & Applied Analysis	Nachman	Dr William Kath Applied Math Northwestern Evanston IL 60208 (847) 491-8784	Mr Donald Sipes VP of Technology ATx Telecom Inc 1251 Frontenac Rd Naperville IL 60563 (630) 369-4299	Nonlinear Schrodinger equation (NLS) model derived and interrogated as descriptor of soliton pulses in optical fibers	Tailoring of various fiber parameters and optimization of fiber segment lengths were obtained from the NLS. Resulting stable stream of optical pulses can be used in various communication settings including LANs on Air Force platforms.
2304B	Physical Mathematics & Applied Analysis	Nachman	Dr Cornelius Horgan Applied Math U Virginia Charlottesville VA 22903 (804) 924-7230	Dr William Avery Boeing Commercial Airplane Group MS/6H-CR Seattle WA 98124 (206) 234-0444	Generalized the St Venant principle to include anisotropic, sandwich, and other composite materials	Stress concentrations produced by rivets, cutouts, etc are felt in a considerable surrounding area and, in the case of composites, in nonclassical (non St Venant) ways. Such nonlocal loads can lead to debonds in laminated airframe panels.
2304B	Physical Mathematics & Applied Analysis	Nachman	Dr Scott Stewart TAM U Illinois Urbana IL 61801 (217) 333-7947	Dr Gordon Johnson Alliant TechSystems Inc 600 Second St NE Hopkins MN 55343 (612) 931-5905	Derived an improved model of detonation front propagation within solid explosives which contains details relevant for modern AF mixtures. Codified the model so that effects of charge shape and fuze position could be examined	A large code called EPIC, which is an Eglin/Alliant code, is exercized at the Eglin Warheads Branch to design warheads for various target scenarios. Stewart's research code has been incorporated into EPIC.
2304C	Computational Mathematics	Schreck	Marsha Berger, Courant Institute, (212) 998-3305	Capt Mike Aftosmis, Wright Laboratory, Flight Dynamics Directorate, NASA Ames Liaison, (415) 604-4499	Adaptively refined Cartesian grids give fast discretization and accurate solutions for computational fluid dynamics on complex external aircraft geometries	Adaptively refined Cartesian grids allowed rapid gridding and fast, accurate solution of Euler equations in support of NASA High Wing Transport/C-17 wind tunnel test.
2304C	Computational Mathematics	Schreck	Marsha Berger, Courant Institute, (212) 998-3305	Earl Duque, US Army Aero-flightdynamics Directorate, (415) 604-4489	Adaptively refined Cartesian grids give fast discretization and accurate solutions for computational fluid dynamics on complex external aircraft geometries	Adaptively refined Cartesian grids allowed rapid gridding and fast, accurate solution of Euler equations for Army configuration studies of AH-64 Apache helicopter.
2304C	Computational Mathematics	Schreck	Alan Laub, University of California at Santa Barbara, (805) 893-3616	Kevin J. Shortelle, System Dynamics International, (352) 371-8035	Improved solution algorithm provides faster, more accurate solutions to the Ricatti equation	Improved Ricatti equation solver aids nonlinear estimation techniques for improving the accuracy of integrated navigation systems like GPS, INS, Doppler.
2304C	Computational Mathematics	Schreck	Charles Kenney, University of California at Santa Barbara, (805) 893-3616	Jim Huang, Alphatech Inc., (617) 273-3388	Small-sample condition estimation quantifies floating point computation errors more accurately and reliably	Small-sample condition estimation quantifies accuracy and reliability of computations for image processing and target recognition.

Subarea	Title	PM	Performer	Customer	Result	Application
2304C	Computational Mathematics	Schreck	Manil Suri, University of Maryland, Baltimore County, (410) 455-2311	Bob Sanderson, Engineering Software Research and Development, (314) 645-1423	Hierarchical hp finite element methods for plates and shells reliably arrive at accurate solutions and resolve fine details in stress fields	Quantitative rules for mesh-degree combinations ensure that computation converges to accurate solution and that irregular load distributions are resolved.
2304C	Computational Mathematics	Schreck	Manil Suri, University of Maryland, Baltimore County, (410) 455-2311	Kamran Izadpanah, MacNeal-Schwendler Corp., (213) 259-4960	Interface method models problems decomposed into several subdomains	These methods allow complex configurations to be decomposed into simpler subdomains. These are then dealt with concurrently and independently to speed solutions.
2304C	Computational Mathematics	Schreck	Bob Peterkin, Phillips Laboratory/WSP, (505) 846-0259	Jim Park, NASA Johnson Space Center, (713) 483-1168	MACH3 is a parallel, coupled, implicit, three-dimensional magnetohydrodynamics code	MACH3 code is used to design and optimize advanced thruster nozzle. This will enable better control of satellite dynamics and longer useful lifetimes.
2304C	Computational Mathematics	Schreck	Bram van Leer, University of Michigan, (313) 764-4305	Veer Vatsa, NASA Langley Research Center, (757) 864-2236	Preconditioning algorithms render the discretized representation of physical problems more amenable to computational solution	Preconditioning algorithms have been implemented in NASA CFD software, yielding faster, more accurate and more reliable computational fluid dynamics solutions for engineers and scientists.
2304C	Computational Mathematics	Schreck	Joseph Flaherty, Rensselaer Poly. Inst. (410) 516-7004	John Jones, Wright Laboratory, Materials Directorate, (513) 255-8787	Adaptive finite element computational models predict crucial physical quantities in chemical vapor deposition processes	These models characterize chemical vapor deposition and enable formulation of a process controller. This controller speeds processing and reduces waste in manufacturing high-temperature ceramic composites, useful for high-temperature coatings.
2304C	Computational Mathematics	Schreck	Joseph Flaherty, Rensselaer Poly. Inst. (410) 516-7004	Thomas Hughes, Centric Engineering, (415) 723-2040	Adaptive finite element computational models predict crucial physical quantities in chemical vapor deposition processes	Chemical vapor deposition prediction software incorporated into Centric Engineering Spectrum Code. This Code is capable of modeling processes for producing high-temperature coatings.
2304D	Optimization & Discrete Mathematics	Glassman	David Goldberg, University of Illinois, (217) 333-0897	Darell Whitley, Colorado State University, (940) 491-5373	State-of-the-art image recognition systems were two slow for the DARPA autonomous vehicle project	Genetic algorithm was applied to the detector formation subsystem and outperformed previous best algorithms.
2304D	Optimization & Discrete Mathematics	Glassman	Jerry Brown, Navy Postgraduate School, (408) 656-2140	Army Base Realignment and Closure Office, Mark Jones, Asst. Chief of Staff for Installation Mgt, BRAC Office, (703) 695-8029; Charles Nemfakus, DUSN, Organizational Management and Infrastructure Team, (703) 693-0258	Brown has developed new modeling techniques which incorporate "persistence," the requirement that decision makers be able to control the extent to which model results are consistent with previous decisions	This model has been used to analyze the Army's budget requirements and to schedule BRAC actions.

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2304D	Optimization & Discrete Mathematics	Glassman	David Shanno, Rutgers University, (908) 932-5472	Irving Lustig, CPLEX Optimization, (609) 497-0984	New, higher order interior methods of optimization have significantly reduced running time for large problems	CPLEX is the most widely used commercial linear programming code. These developments have been incorporated in current or upcoming versions.
2304D	Optimization & Discrete Mathematics	Glassman	Yaakov Bar-Shalom, University of Connecticut, (203) 486-4823	Richard McAllister, Northrup Grumman, (516) 575-1073	In sonar problems where there are large angle measurement errors, the standard conversion between polar and Cartesian coordinates causes bias and provides estimates of the covariances that are too small	New formulas were developed and applied to the E2-C upgrade being developed by Northrop-Grumman.
2304D	Optimization & Discrete Mathematics	Glassman	Dr Ruth Pachter, Wright Laboratory, (513) 255-6671	Pamela Schaefer, Laser Hardened Material Exploratory Program, (513) 255-6671, ext. 3150	Electronic structure determination of optical limiting materials, particularly meso-alkynyl prophyrins, that utilize the reverse saturable absorption optical mechanism, have guided efforts for the design of the molecular systems for pilot protection	Materials with fast nonlinear optical response over broad spectral bandwidths that are critical for laser eye and sensor protection.
2304D	Optimization & Discrete Mathematics	Glassman	James Malas, Wright Laboratory, (513) 255-8787	Dr Ron Shaw, McDonnell Douglas, (314) 232-0444; Dr Leon Perez, Crown Pattern and Foundry, (818) 289-3445; Dr Harold Gegel, UES Inc., (513) 426-6900	Repeated trial and error design was insufficient to deliver a component of the EMD-2 missile with the required mechanical and microstructural properties	WL/ML used concurrent reengineering to define the process parameters needed to achieve the required characteristics.
2304E	Signal Processing, Probability & Statistics	Sjogren	D. Healy, Dartmouth College, (603) 646-3327	Dr Jeffrey Solka, (540) 653-1982, NSWC; Dr Jerry Prince, (410) 516-7031, Integrated Surgical Systems	Multiscale edge representation, source/channel coding; enhanced Computerized Tomography Imagery	Faster Internet image transmission toward Global Infosphere (Reachback Facility); better installation of surgical prosthetics.
2304E	Signal Processing, Probability & Statistics	Sjogren	Peter Sherman, Iowa State University, (515) 294-0091	Dr Robert Bitmead, DSTO, Detection and Evaluation Group, Australia, 61 62 492849	Cyclo-stationary, spectral correlation methods for machine condition monitoring	Analysis of data from Hot Strip Mill, (NDE). Needed for improved turbine blade and helicopter transmission maintenance.
2304E	Signal Processing, Probability & Statistics	Sjogren	Arye Nehorai, Yale University, (203) 432-4260	J. Polcari, Commander, ASTO (Navy), (703) 604-6013; Dr Ben Gray, (203) 440-5355, NUWC	Acoustic vector-sensor processing	Source location with hull-mounted sensors. Faster ID of seaborne targets.
2304E	Signal Processing, Probability & Statistics	Sjogren	Brian DeFacio, University of Missouri, (573) 882-8183	Evan Boole, (573) 882-8183, MD Dept. of Radiology, University of Missouri	Information-theoretic image reconstruction with "soft-threshholding", wavelet compression of remote x-ray images	Remote control of X-ray and ultrasound scanners. Enhanced Combat Theater capability for medical corps G390.

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2304E	Signal Processing, Probability & Statistics	Sjogren	R. Plemmons, Wake Forest University, (910)759-5358	Dr Don Washburn, (505) 846-1597, Starfire Optical Range PL/LIGR, Kirtland AFB NM	Fast adaptive iterative methods for eigenvalue analysis of large sparse and non-sparse matrices	More accurate, quicker computations for the restoration of space-based objects using deformable mirrors. Part of the space-based object sensing effort.
2304E	Signal Processing, Probability & Statistics	Sjogren	Subir Ghosh, University of California at Riverside, (909) 787-3781	Dr Barry McKinney, (315) 330-2922, Rome Lab (RL/ERDS)	Statistical experimental design and data analysis	Correction to an existing methodology for acceleration reliability test and stress monitoring, taking into account several factors that are not "equi-spaced". Applicable to ALQ-131 Electronic Warfare Pod validation.
2304E	Signal Processing, Probability & Statistics	Sjogren	R. Coifman, Yale University, (203) 432-4175	Roy Matic, (310) 317-5931, Hughes Research Laboratory, Malibu	Adapted waveform analysis, multipole and hybrid methods	Fast computation of electromagnetic scattering (phase, amplitude, positioning), critical to antenna placement on F-22.
2304E	Signal Processing, Probability & Statistics	Sjogren	G. Prescott, University of Kansas, (913) 864-7760	Peter Leong, (315) 330-3226, RL/C3BB, Speakeasy Radio; Larry Gutman, WL/AAWW-2	Foundational work in LPI Communication Networks	Speakeasy (Joint Services radio compatibility project) needs to factor in communications covertness requirements. Unified standards lets this effort move ahead.
2304E	Signal Processing, Probability & Statistics	Sjogren	M.V. Wickerhauser, Washington University, St Louis, (314) 935-6771	Dr A. Vassiliou, (918) 660-3749, FMA&H Corp., also to Amoco Technology Center; Dr C. Hwa, (408) 365-5430, Litton Industries Appl. Tech.; Dr X. Wang, (314) 362-7111, Washington Univ. Med. Center	Adapted wavelet Analysis Library licensed to FMA&H	Transmission of CAT imagery as part of Electronic Battlefield, Moble Surgical Hospital reachback and military telemedicine; seismological analysis of mineral-bearing rock.
2304E	Signal Processing, Probability & Statistics	Sjogren	Michael Zoltowski, Purdue University, (317) 494-3512	Dr Jeffrey Bull, (215) 674-5100, Flan and Sussel, Inc.	Advanced adaptive null-steering, 3-D angle estimation with vector sensor arrays	Advanced electromagnetic field sensing. Multipath reinforcement to improve direction finding for received signals. Reduces multipath for improved battlefield Wireless Communication and interferer location.
2304E	Signal Processing, Probability & Statistics	Sjogren	Louis Auslander, O.B.E., SUNY, (212) 642-2483	Hughes Space Co. (Graf Urban von der Embse aus), Saxe-Coburg Goetha, (310) 416-2403	Classification and study of ergodic transformations according to mixing properties.	Robust and efficient Pseudo-Noise encoding methodologies. Critical for covert CDMA mobile wireless and GPS encoding.
2304E	Signal Processing, Probability & Statistics	Sjogren	Alan Willsky, Lab. for Integrated Decision Systems, MIT, (617) 253-2356	Dr Donald Broson, (617) 981-7647, Lincoln Laboratory Satellite Communication Group; Dr Gary Hewer, (619) 939-8414, NAWC, China Lake	Multiresolution methods in laser ranging, tradeoff analysis between image resolution and anomaly rejection. Novel multiple access schemes	Motion detection (optical flow) for rapid detection, ID of moving targets. Development at China Lake for USN Sidewinder missile infrared sensing. Library compression facility for high resolution radar data, medium, long-range surveillance.

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2304F	Systems & Software	Luginbuhl	Cybenko Dartmouth College (603) 646-3843	Jennifer S. Kay, Lockheed Martin, (609) 338-2014	Transportable software agent that can move from machine to machine in a distributed network, accomplishing computing tasks on each machine	Information agents that move within a volatile computer network to retrieve data from remote sources, process it, and present summaries to battlefield commanders.
2304F	Systems & Software	Luginbuhl	Smolka SUNY-Stony Brook (516) 632-8453	Jack Hoffman, Reuters International, (516) 233-6600	Mathematical modeling of concurrent systems	Modeling and analysis of communications protocol used in worldwide financial trading network.
2304F	Systems & Software	Luginbuhl	Lee Univ of Pennsylvania (215) 898-3532	Oleg Sokolsky, (215) 854-0555 Computer Command and Control Company	Advances in graphical specification languages and real-time verification techniques	Specification and analysis environment for real-time systems.
2304G	Artificial Intelligence	Waksman	Dr James Crawford, University of Oregon, (503) 346-0473	Dr Stan Cross, McDonnell Douglas, (503) 346-0473	New class of algorithms for scheduling and planning	Advanced scheduling algorithm for multi-aircraft assembly.
2304G	Artificial Intelligence	Waksman	Mr Vince Velten, WL/AARA, (513) 255-1115	Mr Joe Sacksteder, NAIC/PINPOINT Project, (937) 257-7847	New class of algorithms for IR recognition	Advanced intelligent precision munitions.
2304G	Artificial Intelligence	Waksman	Professor Nandhakumar, University of Virginia, (804) 924-6108	Mr D. Gerson, CIA/ORD RADIUS Program, (703) 351-2727	New class of thermal and physical invatriants for recognition	Advanced Tracking Radar (ATR) systems.
2304I	Electromagnetics	Nachman	Dr David Dobson Math/TAMU College Station TX 77843 (409) 845-1924	Dr J. A. Cox Honeywell Technology Center 3660 Technology Drive Minneapolis MN 55418 (612) 951-7738	Delivered an EM code which couples Maxwell's eqs with optimum design options so that the operation of devices could be both predicted and optimized	An ultra-narrow band, high reflectance filter was designed and optimized for use as a mirror in a vertical cavity surface emitting laser (VCSEL). Such lasers offer attractive optoelectronic and photonic uses for the Air Force.
2304I	Electromagnetics	Nachman	Dr Jeff Herd RL/ER 31 Grenier St Hanscom AFB MA 01731 (617) 377-8904	Mr Kevin Ommodt Texas Instruments MS 8019 PO Box 801 McKinney TX 75080 (214) 952-3779	Analysed the EM output of a microstrip patch antenna array and codified the result. This code has the greatest generality and functionality of any available	Phased array antennas have many virtues (agility, light-weight, conformality to fuselages) which are attractive to the Air Force. The TI effort is specifically concerned with AF Milsatcom program.
2304I	Electromagnetics	Nachman	Dr Vladimir Oliker Matis Inc 1565 Adelia Pl Atlanta GA 30329 (404) 248-9926	Dr Shang Lee DEMACO Inc. 100 Trade Center Drive Suite 303 Champaign IL 61820 (217) 355-4748	A novel application of differential geometry to problems of EM surface ray tracing with special emphasis on effects of local curvature of airframes	An upgrade to XPATCH, the high frequency code most frequently used by the AF to predict airplane scattering attributes (including RCS), will be realized as a result of the ability to more accurately account for local fuselage/wing curvature effects.
2310B	Ionospheric Research	Kroll	Dr Tom Wilheit, Texas A&M, College Station, TX, (409) 845-0176	Ron Issacs, AER, Inc., (617) 547-6207	Ocean Microwave Emittance Model	Used in the development of Unified Retrieval Cloud Detection Algorithms.

Subarea	Title	PM	Performer	Customer	Result	Application
2310B	Ionospheric Research	Kroll	Dr Tom Wilheit, Texas A&M, College Station, TX, (409) 845-0177	Dr Xiaoli Zou, NCAR, (303) 497-8916	Ocean Microwave Emittance Model	Used in the development of 4D data assimilation algorithm development for the MM5 mesoscale prediction model.
2310B	Ionospheric Research	Kroll	Dr Alan Lipton, PL/GPA, (617) 377-2491	Ron Issacs, AER, Inc., (617) 547-6207	Corrections and improvements to the RADTRAN radiative model database	Used in the development of Unified Retrieval Cloud Detection Algorithms.
2310B	Ionospheric Research	Kroll	Mr George Modica, PL/GPA, (617) 377-2956	Dr Bill Kuo, NCAR, (303) 497-8910	Algorithm to solve the radiative transfer equation for the microwave EM spectrum	Development of 4D data assimilation algorithms to incorporate SSM/T-2 data into MM5 mesoscale model initialization.
2310B	Ionospheric Research	Kroll	Mr George Modica, PL/GPA, (617) 377-2956	Dr Alan Lipton, PL/GPA, (617) 377-2491	Algorithms to compute the cloud liquid water accumulated under adiabatic ascent for a given atmospheric layer	Create and evaluate cloud layer models used to construct radiative transfer algorithms.
2310B	Ionospheric Research	Kroll	Dr Bill Kuo, NCAR, (303) 497-8910	AFGWC, Offutt AFB, NE, Col Hayes, DSN 271-5749	MM5 mesoscale prediction model	Used as a theatre scale prediction model to support Bosnian peacekeeping mission.
2310B	Ionospheric Research	Kroll	Dr Paul Krehbiel, NMIMT, (505) 835-5215	Mr Ken Cummings, (520) 741-2838, Global Atmospherics, Inc., Tucson AZ	Development of an experimental Lightning Detection and Ranging system	Develop similar technology to support the National Lightning and Detection Network.
2310B	Ionospheric Research	Kroll	Dr T.N. Krishnamurti, Florida State University, (904) 644-6205	Mr Russel Treadon, (904) 644-2732, National Center for Environmental Prediction, Camp Springs, MD	Physical initialization algorithms for global atmospheric prediction models	Initialization schemes applied to National Weather Service prediction models.
2310B	Ionospheric Research	Kroll	Dr T.N. Krishnamurti, Florida State University, (904) 644-6205	Mr Greg Rohaly, (408) 656-4722, US Naval Oceanographic and Meteorological Prediction Facility	Physical initialization algorithms for global atmospheric prediction models	Intialization schemes for the Navy's NOGAPS globals prediction system.
2310B	Ionospheric Research	Kroll	Dr Larry Mahrt, Oregon State University, (503) 737-5691	Mr Ray Kiess, AFGWC, Offutt AFB, NE, (402) 294-3373	Land surface exchange algorithms for numerical weather prediction	Input to real-time diagnostic agrometeorological model in support of AFGWC meteorological predictions.
2310B	Ionospheric Research	Kroll	Dr John Jasperse, PL/GPI, (617) 377-3083	Dr E. Bauer, Institute for Defense Analysis	Data on ionospheric variability at high latitudes	Targeting error analysis associated with BMEWS UHF radar systems.
2310B	Ionospheric Research	Kroll	Dr John Jasperse, PL/GPI, (617) 377-3083	Dr R. Wolf, Rice University	Auroral electron precipitation rate algorithms	Incorporation into the Magnetospheric Specification Model.
2310B	Ionospheric Research	Kroll	Dr Edward Weber, PL/GPI, (617) 377-3121	50th Space Weather Squadron Falcon AFB, CO	Physical algorithms to explain the formation, evolution and decay of equatorial plasma depletions	Input into a prototype Scintillation Network Decision Aid (SCINDA) program to specify effects on UHF SATCOM systems.

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2311A	Space Physics	Radoski	Dr Richard Radick, PL/GPSS, (505) 434-1390	Capt D. Rider, PL/LIHI, DSN 246-4735 Dr R. Benedict, (505) 242-9992, W.J. Schager Associates	Procedures for high precision photometric observations of space objects	Develop and improve methods for observations of spacecraft using ground based facilities such as the Air Force telescope on Maui.
2311A	Space Physics	Radoski	Dr Richard Altrock, PL/GPSS, (505) 434-7016	J. Hirman, NOAA/SESC, (303) 497-5688, Lt Col C. Tschan, (719) 554-9140, AFSPC/50WS	Daily maps and graphs of solar coronal activity	Used for prediction of space weather.
2311A	Space Physics	Radoski	Dr Stephen Keil, PL/GPSS, (505) 434-7039	Maj R. Kutzman, (719) 554-9140, AFPSC/50WS, Falcon AFB	Report on an upgraded solar observing network	Used as the basis for a decision to replace the existing SOON telescopes.
2311A	Space Physics	Radoski	Dr Richard Altrock, PL/GPSS, (505) 434-1390	Maj R. Kutzman, (719) 554-9140, AFPSC/50WS, Falcon AFB	Technical advice on improving the solar optical observing network	Used to determine the feasibility for developing various optical systems.
2311A	Space Physics	Radoski	Dr Donald Neidig, PL/GPSS, (505) 434-7019	Lt C. Tujo, Mr R. Shweid, AM-ALC/LHW, DSN 633-0590, Mr C. Mitchell, AWS/SYDS, DSN 576-3840, ext 328	Study of a new generation instrument for collecting solar data for operational commands	Used to begin a cradle to grave effort for SOON. Represents a major transition of observing techniques and telescope technology.
2311A	Space Physics	Radoski	Dr Donald Neidig, PL/GPSS, (505) 434-7019	Capt R. Davila, AWS/XOXT, DSN 576-5631, ext 494	Investigation of magnetic shear as a flare predictor	Determined that routine measurements of vector magnetic fields alone would improve the prediction of flares and coronal mass ejections.
2311A	Space Physics	Radoski	Dr Donald Neidig, PL/GPSS, (505) 434-7019	A. Starr, (505) 475-3461, Det 4, AFSPC/50WS, Holloman AFB	Training on new techniques and instrumentation	Used to introduce SOON personnel to solar monitoring and forecasting.
2311A	Space Physics	Radoski	Dr Donald Neidig, PL/GPSS, (505) 434-7019	Capt R. Davila, AWS/XOXT, DSN 576-5631, ext 494	Data on the requirements for space weather forecasting	Used to improve the quality and accuracy of solar forecasting.
2311A	Space Physics	Radoski	Mr Don F. Smart PL/GPSG, (617) 377-3978	Dr James Adams, (202) 767-2747, D.O. Hulburt Center for Space Research, NRL	Technical information on the procedure to determine radiation dose to high flyers	Contributed to a report on the Human Presence in Space as a part of the NRL Space Weather program.
2311A	Space Physics	Radoski	Mr Don F. Smart PL/GPSG, (617) 377-3978	Dr Michael J. Golightly, (281) 483-6190, NASA Johnson Space Center, SN31, Houston, Texas	PC version of the proton prediction model	Used to predict solar proton intensities after a major solar flare. Used at NASA during manned space operations.

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2311A	Space Physics	Radoski	Ms Margaret Shea, PL/GPSG, (617) 377-3977	Dr David H. Smith, (202) 334-3477, Space Studies Board, National Academy of Sciences	Information on space weather	Used for reports on Space Weather and for a scientific workshop at Sacramento Peak Observatory.
2311A	Space Physics	Radoski	Mr S.W. Kahler, PL/GPSG, (617) 377-3978	Lt Kelly Fedel, (301) 981-2270, USAF, Suite EE0100, 1535 Command Drive Andrews AFB	Data on Japanese efforts in solar physics and space weather forecasting	Increase the data base of foreign researchers and institutes working in areas of interest to USAF.
2311A	Space Physics	Radoski	Ms Margaret Shea, PL/GPSG, (617) 377-3977	Dr George R. Davenport, DSN 692-7750, ARINC Incorporated, Colorado Springs, CO	Information on solar-terrestrial phenomena and space weather	Establish a capability to address space weather effects on operational military and civilian systems.
2311A	Space Physics	Radoski	Mr E. W. Cliver PL/GPSG, (617) 377-3975	Ms. Helen Coffey, (303) 497-6223, STP Division, National Geophysical Data Center, NOAA, Boulder, CO	Algorithms for reading solar radio data acquired by the USAF Radio Solar Telescope Network	Used to create displays of solar radio data to make assessments of solar driven space weather phenomena.
2311A	Space Physics	Radoski	Ms Margaret Shea, PL/GPSG, (617) 377-3977	Dr Michael J. Golightly, (281) 483-6190, NASA Johnson Space Center, SN31, Houston, Texas	Information on solar-terrestrial phenomena that affect the space environment	Used for briefings on solar-terrestrial and space weather effects on NASA operations.
2311A	Space Physics	Radoski	Mr E. W. Cliver PL/GPSG, (617) 377-3975	Ms. Helen Coffey, (303) 497-6223, STP Division, National Geophysical Data Center, NOAA, Boulder, CO	Technical information on sweep frequency records of solar metric radio activity	Used for post-analysis of solar induced geophysical disturbances to allocate archival resources related to space weather.
2311A	Space Physics	Radoski	Mr E. W. Cliver PL/GPSG, (617) 377-3975	Mr Kevin Scro, (719) 567-6332, 50th Weather Squadron, Falcon AFB, Colorado	Software to expedite processing of real time solar wind plasma and magnetic field data	Provide improved forecast of geomagnetic storms to DOD customers with C3I systems that depend on the space environment.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr Ron Turner, (703) 416-3264, ANSER, Arlington Virginia	Technical information on solar proton events	Used to assess the risk for manned space missions to the moon and to Mars.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Ms Nicole D. Kerness, (607) 751-4758, LORAL, Owego, New York	Technical information on galactic cosmic radiation, neutron monitors and solar particle events	Used to study measurements of neutron monitors in support of efforts to understand single event upsets.
2311A	Space Physics	Radoski	Ms Margaret Shea, PL/GPSG, (617) 377-3977	Dr D.S. Toomb, (909) 624-0175, SAVE Inc., Claremont, CA	Technical information on solar proton events and cosmic radiation	Used to correlate anomalies on an Air Force spacecraft with space weather to develop more robust future designs.

Subarea	Title	PM	Performer	Customer	Result	Application
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Mr Karin Johansson, 46-18-530-265, Saab Military Aircraft, Linkoping, Sweden	Technical information on cosmic radiation and solar particle events	Used to understand the environment at aircraft levels, especially the possibility of single event upsets.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr Henry Zakrzewski, (714) 896-5215, McDonnell Douglas Aerospace, Huntington Beach, CA	Technical information on solar proton events	Estimate the effect of the space radiation environment on the electronic devices used in Delta launch vehicles and on other missions.
2311A	Space Physics	Radoski	Mr S. W. Kahler, PL/GPSG, (617) 377-3978	Dr James Klimchuk, (202) 404-8136, NRL Space Sciences Division, Code 7675, Washington, D.C.	Design details of the Solar Mass Ejection Imager and information on the detection of coronal mass ejections	Incorporated into a report on the forecasting of space weather phenomena.
2311A	Space Physics	Radoski	Mr Don F. Smart, PL/GPSG, (617) 377-3978	Dr Gregory Ginet, (617) 377-3974, PL/GPSP, Hanscom AFB, MA	Software to predict the onset time of a geomagnetic disturbance from a solar shock wave	Incorporated into the PL/GP Geospace Program to be used by the USAF 50th WS at Falcon AFB, Colorado.
2311A	Space Physics	Radoski	Ms Margaret Shea, PL/GPSG, (617) 377-3977	Mr E. Erwin, (303) 497-6133, STP Division, National Geophysical Data Center, NOAA, Boulder, Colorado	Information from neutron monitors on the maximum cosmic ray intensity during a relativistic solar proton event	Used to compile cosmic radiation data from neutron monitors since the start of measurements in 1953.
2311A	Space Physics	Radoski	Mr Don F. Smart, PL/GPSG, (617) 377-3978	Capt. Carter Borst, (303) 497-5999, 50th Weather Squadron, NOAA, Boulder, Colorado	Software to predict the radiation dose to air crews from cosmic radiation	Used to predict the radiation dose to air crews from galactic cosmic radiation anywhere in the world at altitudes up to 87,000 feet.
2311A	Space Physics	Radoski	Ms Margaret Shea, PL/GPSG, (617) 377-3977	Dr Fumihiko Tomita, 81-86-544-2155, Hiraiso Solar Terrestrial Research Center, 3601 Isozaki, Hitachinaka, Ibaraki 311-12, Japan	Information on the relationship between solar proton flux above 50MeV and single event upsets	Incorporated in to the support given to Japanese satellite operation groups, especially for spacecraft in geosynchronous orbit.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr Jack Grandman, (303) 341-3928, Hughes Aircraft Company, Aurora, Colorado	Technical Information on cosmic radiation and solar particle events	Used to understand the onset of single event effects and the possibility of predicting when they might occur.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr David J. Strobel, (619) 679-9087, Space Ellectronics, Inc. San Diego, CA	Technical information on galactic cosmic radiation and solar particle events	Used to support engineering modeling of new microelectronic products and for incorporation into a space parts handbook.

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2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr Farhad Radpour, (310) 336-5000, Hughes Space and Communications, El Segundo, CA	Technical information on galactic cosmic radiation and solar particle events	Used as background material for radiation effects assessments and analysis programs.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr Rocky Koga, (310) 336-6583, The Aerospace Corporation, El Segundo, CA	Technical information on galactic cosmic radiation and solar particle events	Used in efforts to support Air Force operations in space.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr Bill Heidergott, (602) 732-4285, Motorola, Government and Systems Technology Group, Chandler, Arizona	Information on galactic cosmic radiation, solar proton events and geomagnetic cut off rigidity values	Used to understand the environment in which the Iridium satellites operate.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Mr Ron Travis, (508) 443-9521, Nuclear and Space Radiation Effects and Analyses, Raytheon Co., Sudbury, MA	Information of the space environment, cosmic rays and solar particle events	Used to understand the environment that can induce single event effects for application to the Trident Missile.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr Virgil H. Strahan, (714) 538-1337, Autonetics Electronic Systems Division, Rockwell International Corproration, Anaheim, California	Technical information on solar particle events and galactic cosmic radiation	Used in support of GPS and Rockwell's ground based interceptor program.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr Jack Woods, (617) 981-4028, Satellite Communications Technology Group, MIT Lincoln Laboratory, Lexington, MA	Information on galactic cosmic radiation and geomagnetic cutoff rigidities	Used in a Lincoln Laboratory satellite program.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr John L. Andrews, (610) 354-3840, Lockheed, Martin Astro Space, Philadelphia, PA	Information on galactic cosmic radiation and solar proton events	Used as background information for programs on survivability of space systems.
2311A	Space Physics	Radoski	Ms Margaret Shea and Mr Don F. Smart, PL/GPSG, (617) 377-3977	Dr John W. Adolphsen, (301) 776-8886, Eng. Consulting Service Fulton, MD	Information on galactic cosmic radiation and solar proton events	Used in support of NASA programs at Goddard Space Flight Center.

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2311A	Space Physics	Radoski	Dr Michael Heinemann, PL/GPSP, (617) 377-8660	Maj Mike Christi, DSN 692-3242, Peterson AFB, CO	Algorithm for improved magnetic field mapping	Used in the operation of the Magnetospheric Specification and Forecast Model by the 50th Weather Squadron.
2311A	Space Physics	Radoski	Dr Gregory Ginet and Dr William Burke, PL/GPSP, (617) 377-9658	Maj Mark Confer, (617) 377-2433, DSN 478-2433, Program Manager, USAF PE 63410F, Space Systems Environmental Interactions Technology, Hanscom AFB, Massachusetts	Analysis of electron heating observed in the OEDIPUS C sounding rocket experiment	Used to explain high levels of energetic electrons caused by an on-board radio wave source observed by particle sensors on the rocket.